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# Metaphors in the construction of theory: Ramus, Peirce and the American mind

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American mind**

**Trufant, Laurel Warren, Ph.D.**

**University of New Hampshire, 1990**

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METAPHORS IN THE CONSTRUCTION OF THEORY:

Ramus, Peirce and the American Mind

BY

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DISSERTATION

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in

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1990

Laurel Warren Trufant

To Donald J. Wilcox

The brightest mind and the gentlest soul  
I've ever encountered.

"If I do anything it will be his work."  
CP 3.405

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**ABSTRACT**

**METAPHORS IN THE CONSTRUCTION OF THEORY:**  
**Ramus, Peirce and the American Mind**

by

Laurel Warren Trufant  
University of New Hampshire, December, 1990

This study argues for the mutual impenetration of logical, legal and scientific metaphors and attempts to determine the role played by them in the construction of theory. Specifically it attempts to discover the impact which the metaphors of topical logic may have had on the construction of American ideology.

Chapter 1 offers a brief discussion of logical metaphors and their relation to the social and intellectual settings which generate them. Chapter 2 extends that discussion to principles of positive law and political order as they developed in the unstable atmosphere of 16th Century Europe. Chapters 3, 4 and 5 attempt to relate the metaphors defined in Chapters 1 and 2 to the development of the scientific models which emerged during the "scientific revolution" of the 17th Century. These chapters proceed in the context of a discussion of the interaction of Aristotelian, Cartesian and Ramean paradigms.

Chapter 6 argues for the crucial importance of topical metaphors in the establishment of order in the American colonies. Chapters 7 and 8 carry the argument for a "New

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England Mind" into a national setting and discuss how Ramean metaphors contributed to the construction of American conceptions of political order and physical law. These chapters attempt to identify a controlling metaphor of continuity which operated at the base of American models.

Chapter 9 claims this metaphor of continuity as the logical ground of pragmatic thought, transmitted to C. S. Peirce through the German logical tradition via Leibniz and Wolff. Chapter 10 extends that discussion to a specific investigation of Peirce's *Illustrations of the Logic of Science*, considered here as representative of a fundamental commitment on Peirce's part to a methodology which would underwrite the rest of his thought. Chapter 11 laments the failure of James, Dewey and Royce to appreciate the power of Peirce's model and discusses the effect which their fragmentation of his continuous reality had on American philosophy. Peirce's logic of science emerges as a fundamental expression of an "American mind" with roots sunk deep in a Ramean logical paradigm.



## PROLOGUE

This is a germinal study, intended more to suggest than to convince. It skirts many fascinating issues and scans the surface of others. It offers no demographics, no charts, no quantitative analyses -- in short, nothing to gladden the heart of social historians or sober statisticians. Moreover it proceeds under a clear methodological bias to which I may as well confess at the start. It patently assumes that there are such things as "characteristic German models," "a French intellectual milieu," "English epistemology" or "a New England Mind." I think there are. The question addressed here is why?

This study offers a possible answer grounded in the positive role which metaphors play in the construction of theory. It argues for the mutual impenetration of logical, legal and scientific metaphors embedded in diverse intellectual settings and attempts to determine the role played by those metaphors in generating characteristic principles of order. Specifically it attempts to discover the impact which the peculiar metaphors of the topical logical tradition may have had on the construction of American ideology.

Chapter 1 offers a brief narrative of the provenance of those metaphors and their relation to the

social and intellectual settings which generated them. It establishes the topical logic of Peter Ramus as legitimate heir to the tradition of Peter of Spain and explores the effects which Ramean logic had on European models as it interacted with existing forms of analysis. Chapter 2 extends that discussion to questions of positive law and political order as they developed in the unstable atmosphere of 16th Century Europe. Chapters 3, 4 and 5 attempt to relate the metaphors defined and described in Chapters 1 and 2 to the development of the scientific models which emerged in England, France and Germany during the "scientific revolution" of the 17th Century. These chapters proceed in the context of a discussion of the interaction of Aristotelian, Cartesian and Ramean paradigms.

Chapter 6 argues for the crucial importance of topical metaphors in the establishment of order in the American colonies -- an argument already carefully explored by Perry Miller but expanded here to include specifically logical perspectives. Chapters 7 and 8 carry the argument for a "New England Mind" into a national setting and discuss how Ramean metaphors and images contributed to the construction of American conceptions of political order and physical law -- conceptions unique by virtue of being an amalgam of the three models defined in earlier chapters. These discussions attempt to identify a controlling metaphor of continuity which operated at the base of American

political and scientific models. The proposed metaphor of continuity draws directly on the conceptual biases of topical logic.

Chapter 9 claims the metaphor of continuity as the logical ground of pragmatic thought, transmitted to C. S. Peirce through the German logical tradition via Leibniz and Wolff. Chapter 10 extends that discussion to a specific investigation of Peirce's *Illustrations of the Logic of Science*, considered here as representative of a fundamental commitment on Peirce's part to a methodology which would underwrite the rest of his thought. Chapter 11 laments the failure of James, Dewey and Royce to appreciate the power of Peirce's model and discusses the effect which their fragmentation of his continuous reality had on American philosophy.

Throughout my bias is clear. I see in Peirce's logic of science an expression of an "American mind" with roots sunk deep in a Ramean logical paradigm. The persistence of Peirce's influence, the continuing impact of his insights on the construction of theory and the enduring ability of his often paradoxical thought to confound and inspire all bear witness to the fundamentality of his vision and its crucial importance for an understanding of the American intellectual tradition.

Chapter 1  
CHANGING PLACES:

Metaphors  
in  
The Construction of Theory

Greek logic had dealt with consciousness as a principle of order, focusing its theories on an impersonal mind in search of models and norms. Christianity, on the other hand, conceived of the individual as the protagonist in a cosmic drama whose dénouement described nothing less than his own salvation. Thus Christian eschatology required a logic which could do more than define principles of order. It required a logic which could provide the pilgrim with a path to Truth.

The psychological immediacy of the Christian message encouraged the construction of logical metaphors which portrayed cognition as a function of an "inner sense" and consciousness as a world of inner meaning. Under the operation of these powerful metaphors, human events, as the history of man's journey toward God, acquired a significance which extended beyond the immediate present to encompass a collective past. Christianity, in fact, made human history cohere in a type of *societas* which transcended all previous formulations of the social order.<sup>1</sup>

Under its influence the medieval world developed as a society based on interdependent relationships and communal ideals -- a complex society in which ritual, politics and custom all coalesced and re-emerged in an organic whole in which cult and culture were joined.<sup>2</sup> This total integration of ritual with life in turn yielded a symbolic view of the natural world which acquired an immense metaphysical richness when overlaid with the physics of man-as-microcosm. Here events possessed archetypal meaning, time reflected a moving image of eternity and nature itself became a cipher. "The ethic and aesthetic value of the symbolic interpretation of the world was inestimable," Huizinga asserts. "Embracing all nature and all history, symbolism gave a conception of the world of a still more rigorous unity than that which modern science can offer."<sup>3</sup>

But symbolism did little to advance the cause of objective knowledge.<sup>4</sup> Although medieval science achieved a certain explanatory force through definition and classification, it tended, due to its metaphysical assumptions, to undervalue secondary causes and to view all phenomena *sub species aeternatis*. Its metaphoric base precluded any notion of development in the realm of organisms and rendered previous Greek insights into the application of mathematics in physics irrelevant. Indeed, the symbolist mind viewed Unity as a non-numerical concept and pursued mathematical analyses which were purely Pythagorean in nature. "Symbolism was like a second mirror held up to

that of the phenomenal world itself," Huizinga points out.<sup>5</sup> Laboring under its constraints, medieval science could construct no objective theory and pursue no truly experimental course.

E. A. Moody stresses the crucial importance of the fact that medieval logic "achieved its distinctive form of development in almost complete isolation from scientific applications."<sup>6</sup> In a symbolic world, logic performed a communal function. It maintained the race's consistent set of conceptions across time and brought the contingent facts of existence into right relation with ethical and spiritual ideals. The metaphors which supported the tightly woven fabric of medieval culture and symbolic thought expressed a theory of knowledge wherein individual terms denoted complex structures understood through penetration into their larger reality.<sup>7</sup> Under analysis, each of these structures yielded a series of forms -- *formalitates* -- which existed independently of the mind as elements in that wider truth which symbolism sought to express. But since the symbolic view of nature assumed a correspondence between the formalities of thought and metaphysics, medieval logic had no need to consider whether its forms reflected present realities.

Symbolism in fact rendered logic a function of metaphysics, removing it from the objective world of science. Moreover, it effectively divorced logic from rhetoric. In a symbolic world, truth is its own advocate.

It requires no exposition. So the logic which dominated the Schools into the 12th Century developed in relative isolation from both scientific and rhetorical metaphors. Its dialectic evolved as a discipline primarily concerned with the syntactic properties of language and the logical form of propositions.<sup>8</sup> The universal use of Learned Latin in the Schools served to strengthen this orientation away from contextual concerns and to anchor medieval logic firmly in the formalist tradition.<sup>9</sup> Late in the 12th Century, however, the medieval *corpus logica* was augmented by Aristotle's *Topics* and *Prior Analytics*. "Relatively slight use was made of the *Prior Analytics*," Moody notes, but the *Topics* exerted a profound influence on Scholastic thought.<sup>10</sup>

The *Topics* outlined a system of logical order which differed radically from the system of categories which governed Aristotle's logic. Categories defined ideal groupings which organized thought qualitatively. *Topics* functioned as headings, or key notions, which organized experience quantitatively. The topics thus expressed a substantially more concrete system of order in that they represented actual "places" in which to "store" the objects of experience, rather than extramental constructs under which to classify ideas. For example, *relation* indicated a category -- related *things* occupied a "place." *Similarity* indicated a category -- Similar *things* occupied a "place."

These differences between topical and categorical metaphors carried profound methodological implications for the construction of logical arguments. Consider the construction of a categorical argument:

Man is rational -- (an assertion)  
What is rational is dialectical -- (a judgement)  
Therefore, man is dialectical -- (a conclusion drawn  
from an assertion and  
a judgement)

On the other hand, a topical argument would proceed quite differently:

*Is Man Dialectical? -- (a question which sends the  
inquirer to examine the place  
where dialectical things  
reside)*

*What is rational is dialectical -- (a discovery he  
makes when he  
examines the place  
"dialectical")*

*But man is rational -- (a discovery he makes when he  
examines the place "rational")*

*Therefore man is dialectical -- (a consequence of a  
question and two  
discoveries)*

Note the crucial differences. The topical argument begins with a question, not an assertion. It proceeds by breaking down the question rather than by further abstraction. The middle term "rational" is "discovered" in its "place," which is in turn searched for the term "man." And finally, all three terms are redistributed to form a statement.

Topical logic thus drew on a completely different set of metaphors from those which governed categorical logic.<sup>11</sup> The categories organized personalist assertions in abstract configurations which in turn led to deductive conclusions. The topics governed the spatial manipulation of concepts to



arrive ultimately at inductive consequences. The topical argument expressed a diagrammatic rather than an abstract order. It treated concepts like objects which could be "located" to supply predicates and "rearranged" to construct arguments. Under a topical model predication involved a search, not an assertion, and judgement involved disposition, not deduction.

This shift in logical metaphors had profound consequences for late medieval logic. For Aristotle, categorical logic had aimed at defining truth with metaphysical certainty, while the *Topics* had dealt rather with the rhetorical art of communicating a perspective on truth. Topical arguments thus trafficked in probabilities. But, whereas in the Hellenic world the *Topics* had been confined to the secular art of political discourse, in the intensely religious atmosphere of 12th Century Europe this art, grounded in probability and directed toward action, entered the service of a Christian God whose objective was to compel personal conviction. When the rhetorical focus of Aristotle's *Topics* converged with the controlling metaphors of Christian logic, there emerged an essential correspondence between meaning and truth which influenced Western thought in profound ways, shaping pedagogical practices, encouraging humanist attitudes and underwriting revolutionary ideologies. Eventually this correspondence acquired concrete expression in pragmatic thought.

The exegetical function of medieval logic, which required that it not only explicate the Book of Nature but also construe authoritative texts in support of doctrine, prepared it in a peculiar way to accept the message of Aristotle's *Topics*.<sup>11</sup> The logical metaphors of medieval Christianity could easily extend themselves to incorporate intensional contexts determined by verbs such as "believe", "doubt" or "desire." Indeed, the psychological immediacy of Christianity carried a natural potential for blurring the distinctions between formal and probable logic. Under the influence of Aristotle's *Topics*, this potential became actual in the topical logic of Peter of Spain. Known as the *logica moderna*, this "new" logic formulated its propositions metalinguistically, insisted on an extensional approach to language analysis and concerned itself with both syntactical and semantical issues. It introduced questions of meaning into a dialectic dominated by certainty. In short, it demanded relevance.<sup>12</sup>

Greek metaphysics could not have supported logical metaphors like those which controlled topical logic. It lacked a sufficiently personal psychology to conceive of truth as perspective. Such a development required the Christian doctrine of the *logos* - the Word made flesh - to justify its implicit assumption that certainty could reside within the natural language structures of men. The topics portrayed logic as a reflection of the natural world in the structures of the mind. Topical arguments procured their

premises through the mind reaching back to the traditional wisdom of the race and allowing that contact to induce a flow of ideas from its *loci* or "places". The mind then arranged these ideas in patterns consistent, not only with its own structures, but with those of nature. The "places" contained the common experience of all men, stored for recall through inquiry. In a sense, topical metaphors manifested the drive in medieval culture to subordinate individual to group motives and exemplified its communal orientation. Closely tied to images of structure, the "places" provided a logical mechanism for investigating a common past conceived as a racial present. Thus, while reorienting logic by incorporating into it the psychological constituents of rhetoric, Peter's "place" or "topical" logic continued to draw on the central metaphors of medieval realism. It reaffirmed the communal aspects of knowledge.

Topical logic exerted a pervasive influence in the Schools.<sup>14</sup> Its ability to portray thought in concrete images made it particularly useful in a pedagogical setting where learning took place through indoctrination rather than investigation. The "arguments" peculiar to topical logic focused on the extension of terms and had a curious tendency to "fix" concepts in the external world. Moreover, the "places" themselves encouraged a constant trafficking in concrete images which in turn generated a conception of thought as a process whereby objects were some-

how lifted into the mind where they behaved in ways crudely analogous to "things."<sup>15</sup>

By thus treating concepts as commodities which one could "store" and "recall," topical logic served as an ideal model for teaching. Moreover, by equipping the logic of the Schools with the tools of discourse, it provided dialectic with an outward reference which made it easily adaptable to pedagogy. The need to communicate a body of usable knowledge to large numbers of students required a simple, concrete method capable of dealing with contextual issues. Peter of Spain supplied it, complete with a delivery mechanism adequate to the task. The phenomenal growth of the Universities during the 12th Century can in fact be seen as both cause and effect of the almost universal acceptance of Peter's model.<sup>16</sup>

But the comfortable accommodation of topical logic to the educational and conceptual landscape of the 12th Century disintegrated rapidly with the full-scale assimilation of Aristotle's scientific works in the 13th.<sup>17</sup> The naïve realism of the "places" simply could not absorb all the analytical implications of peripatetic science. The Aristotelian scheme of the physical world differed radically from the symbolic view. Its incorporation under Christian doctrine would have meant abandoning its entire theory of natural substances and dismantling its cosmological framework. Moreover, Aristotelian science reached the West through Arabian and Jewish commentaries which them-

selves carried metaphysical assumptions that had to be rationalized or discarded before the scientific knowledge they contained could be isolated and merged with existing doctrine. These Semitic commentaries all tended toward a concern for scientific demonstration rather than personal conviction. Yet the psychological focus of Christianity continued to demand a relevance beyond the purely objective requirements of science.

Confronted with a philosophical model which claimed competence in metaphysics yet accepted no evidence other than natural knowledge, the Schools at first attempted to reconcile their revelatory faith with Aristotelian science. But they soon discovered that no general theory of reference could satisfy all the requirements of an objective science without endangering Christian doctrine. Since they could not violate the articles of their faith, the Schools turned instead to an internal critique of the evidential criteria of the new knowledge -- a critique which established a radical distinction between the proper domains of physics and metaphysics. But from the moment the Scholastics chose to insulate their faith from the dissolvent effects of Aristotelian science by challenging the metaphysical competence of their logic, they ensured the ultimate failure of their efforts at assimilation and began a descent into philosophical empiricism which could only end with the destruction of faith altogether.

Aquinas stood at the apogee of this Scholastic effort. With him, the metaphorical concreteness of the "places" yielded to an uneasy alliance of matter and form in a logical *compositum*.<sup>18</sup> The fertile concept of "inner sense," grounded in the communal images of the topics, fell before the more empirical *intellectus agens* which gained knowledge through abstraction rather than penetration. Thomas' logic kept strictly to the Aristotelian view of matter as pure potency and form as an anomaly which of itself existed neither actually or potentially. From this world of matter and form, the mind abstracted the *quidditates rerum materialium*, but could not penetrate to their essential structure. Still, Thomas' theology demanded that the intellect function as an independent personality with access to metaphysical truth. The impersonal pan-psychic principles of the Arab commentaries clearly could not satisfy the metaphoric demands of Christian soteriology. For Peter of Spain, the problem simply had not existed. Concrete objects and intellectual forms had functioned as woof and warp of the same tightly woven logical fabric. But for Thomas, encumbered with Aristotelian science, the consoling metaphors of topical logic no longer proved apt, while the Scholastic critique left him prey to the competing claims of faith and reason.

Thomas' logical *compositum* thus left Scholastic philosophy curiously maladjusted, relegating the mind of the pilgrim to a world where the present realities of sense

experience no longer guaranteed inner perceptions. Thomas argued for a disjunctive model of human knowledge which, unlike Christian doctrine, ascribed the principle of individuation to matter alone. Under the metaphors of his logic, the objects of knowledge existed wholly in the perceptual order, the translation of the object from matter to mind occurring through the mysterious process of abstracting forms from individuating material conditions. But since Thomas, like Aristotle, drew a radical distinction between matter and form, his theory left the objects of knowledge accessible only to the lower faculty of sensation: *particulare sensitur; universale intelligitur*. Thus he ended by denying the possibility of direct knowledge of the material world and rejecting the possibility of an objective science.

In reaction, Duns Scotus set out to rehabilitate objective knowledge and restore the metaphorical foundations of science. Significantly, however, he did not attempt to reclaim material facts by isolating them from their abstract ground or raising them to a level of reality inconsistent with their function. Rather he chose to reintegrate them into that wider symbolist truth which assumed a manifold reality shared through cognition.<sup>19</sup> Against Aquinas, Scotus argued that the world of objects derived from the successive imposition of logical forms on a material principle which existed actually, not potentially. Individuality, he claimed, resulted from the

limitation of a common *natura*, of which it functioned only as the most immediate expression. The *haecceitas* or "thisness" of a thing merely expressed a positive determination existing formally within the object alongside its material effects. Both the formal determination and the material effects, he claimed, remained accessible to the mind through inquiry.

By thus investing matter with a positive actuality, Scotus reinstated it as an element of shared experience. Moreover, by substituting formal for real distinctions between the elements in Thomas' *compositum*, he endowed the objects of nature with logical attributes which tied them to formal truth. Each material fact, he argued, expressed a specifically determined grade of Being which affected the mind as a concrete union of sensible and conceptual elements. The complexity of the process of cognition merely reflected the complexity of the object, which existed as neither matter, nor form, nor *compositum*, but rather as a determined unity constituted of the *ultima realitas entis* of all three. Thought and reality, he concluded, enjoyed a correspondence based in the very nature of concepts which, although arising in the mind, were occasioned by formal principles enjoying an extra-mental status. By thus emphasizing the mutual impenetration of mind and matter, Scotus revalidated the natural world as a source of common experience and confirmed the possibility of an objective science.



Scotus upgraded the ontological status of Aquinas' logical forms in order to bring the neutral potency of Aristotelian matter within the conceptual boundaries of Christian doctrine. Significantly he did so in the context of metaphors which acknowledged the shared aspects of human experience. Ockham, on the other hand, more concerned with the logical than the spiritual implications of Aquinas' model, passed beyond Scotus' realist posture in his own critique to a new principle of logical order unrestricted by common natures and bounded only by the laws of contradiction. He subjected both Scotus' and Aquinas' theories of individuation to a long and searching critique and ended by denying both their formal and their real distinctions.<sup>20</sup> In the process he pulled the logical ground out from under Scotus' world of common experience and cast a new and deeper shadow over the possibility of an objective science.

Formal concepts, Ockham maintained, existed only by virtue of being affirmed of individuals. They represented only abstract notions under which the mind grouped material facts. The problem of cognition, he argued, thus dissolved into a purely syntactic problem relating to the referential use of terms in propositions. It required no logical exposition since it referred to no formal ground. Ockham's razor thereby trimmed all the contextual elements from logic, leaving only those terms which could be dealt with empirically through an analysis of language structures. It

reduced the *species intelligibiles*, which had given Scotus' logic its contextual import, to environmentally dependent "habits" which inclined individual minds through repetition. But where Scotus' "species" had tied the cognizing individual to a collective past -- to that consistent set of conceptions which had structured all medieval life and thought -- Ockham's "habits" supplied only convenient mental fictions incapable of unifying human experience in a common frame of reference.<sup>21</sup> All support of a community of knowledge thus disappeared. Ockham's logic no longer expressed a common cognitive process or a cultural ideal. It expressed rather a set of "willed verbal relationships" between an isolated mind and its extra-mental surroundings.<sup>22</sup> Under the metaphors of this logic, each individual mind entered into a contractual bond with formal reality by "legislating" concepts as tools to manage its perceptions. Concepts themselves regressed to the status of conventions co-opted by the individual for use in controlling his environment.

Ockham removed the entire realm of abstraction from the field of logic by isolating and magnifying the quantitative metaphors of the topical tradition.<sup>23</sup> But in the wake of his reformulation, the *loci* retained no independent significance. They expressed either terms of second intention, in which case they functioned as signs and belonged to linguistic analysis; or else they expressed terms of first intention, in which case they stood for real things

and belonged to physics. In either case, they gave no insight into truth. This shift in metaphors transformed the world of nature from a symbolic universe informed by essences to an infinitely various agglomeration of individuals intelligible in terms of their own movement and relationships. By thus encouraging the observation and manipulation of terms as *things*, Ockham undoubtedly facilitated an expansion of objective knowledge.<sup>24</sup>

But Ockham's critique did not supply the logical tools necessary to construct a scientific world-view. Although Ockham expanded logic's ability to observe and express, he sacrificed its ability to explain. He defined a scientific logic, but not a logic of science. The controlling metaphors of his logic, made explicit in his analysis of language, precluded hypotheses as cognitively meaningless and reduced cause to an accidental relation perceived empirically rather than an empirical connection conceived logically. By reducing Thomas' real and Scotus' formal distinctions to a functional difference between evidential and inevidential facts, Ockham in fact created a model of human knowledge woefully ill-equipped to support a general theory of science.<sup>25</sup> He construed general propositions as conditional statements and denied the ability to infer from experience anything that transcended it. With no causal inferences to link events, perceptions could not cohere in rules or generate predictions and the possibility of for-

mulating the principles of a general science disappeared in a crowd of self-sufficient particulars.

But if terminist logic failed to generate metaphors which could support the growth of a theoretical science, it carried a potent charge for social theory.<sup>26</sup> As a concomitant of the general movement afoot in the 15th Century to repudiate traditional authorities, Ockham's search for a new criterion of meaning coincided with a rejection of social theories based in community.<sup>27</sup> Moreover, it encouraged a moral scepticism which flourished on the disillusionment fostered by the dissolution of the medieval world. As the tightly seamed metaphoric garment which had clothed medieval society rent, so also the underlying collaboration of custom, revelation and life began to crumble. The rise of territorial states and the creation of an international commerce introduced a conception of society grounded in competition, not community.<sup>28</sup> With the Pope a puppet at Avignon and the Conciliar Movement afoot in France, the unity of Latin Christendom fell irrevocably assunder. As the Church regressed from a mystical to a political form, the "body of the faithful" dissolved into a membership governed by the rules of association rather than the traditions of mutual participation.

The metaphors of nominalist logic perfectly expressed this culture. Preoccupied with change and focused on the limits rather than the scope of human experience, they could readily articulate the encroaching disorder. But

they could offer no reassurance to minds disoriented by profound changes in their social, political and moral environments. In vain did the Council of Trent reassert the authority of traditional forms. The nominalist pilgrim, increasingly isolated from familiar and consoling communities, faltered on his journey, prey to deeply divided perceptions about his role in the world -- until the *via moderna* showed him the way.

Renaissance humanism pointed the way to new principles of logical order. It provided an escape from the limiting metaphors of nominalist logic by explicitly recognizing the normative powers of shared experience. In reaction against the nominalist tendency to isolate the individual from contextual concerns, the humanists reasserted the need to reach back to a common fund of knowledge and experience in pursuit of truth. At the core of their program lay the need to communicate individual perceptions of a shared reality. Humanism thus established a new link with the past by focusing on the possibilities of human history rather than the limits of human knowledge.<sup>29</sup> It rejected the isolation of the nominalist pilgrim in favor of an ideal community achieved through communication.

This new ideal of communication, however, required logical metaphors vastly different from those which had controlled terminist logic. In Ockham, the rhetorical functions of logical discourse had all but disappeared. The need to communicate shared knowledge which had sup-

ported the introduction of rhetorical metaphors in the topical tradition had no relevance in a logic where all knowledge derived from the direct apprehension of individuals by individuals. The humanists, on the other hand, tended to exploit the latent rhetorical and probabilistic elements of topical logic and to make these metaphors more explicit. Although, ironically, they condemned the *summulistas* as the arch-villains of scholastic thought, the humanists in fact based their entire logical program on the "half-conscious blurring of probable argumentation and scientific demonstration" typical of the topical logic of Peter of Spain.<sup>30</sup> Rhetoric, as the grammar of thought, allowed the humanists to grasp the shared structures of reality expressed through language. Its incorporation under logic promised to draw together the fragmented elements of experience left by the "narrow seive of contradictions" which nominalist logic had become.<sup>31</sup>

In a metaphoric sense, humanism collapsed all nominalist diversity into an absolute community by subordinating general systems to personal perspectives. As such it expressed a movement of hope in the general atmosphere of moral scepticism and decline endemic to 15th Century Europe. Humanism rejected all the harsh formalism of the scholastics as well as the rigid limitations of the terminists, finding neither sufficient to express the mobility and infinite variety of the world of human experience. With rhetoric, the humanist set himself against his

fragmenting environment and attempted to impose a human order and community on an open and discontinuous world.<sup>32</sup> The individual himself took on the aspect of a constant framework against which a changing reality unfolded.

But the humanist program created a crisis in the Schools by challenging the primacy of dialectic and championing the rhetorical arts.<sup>33</sup> By demanding that all logical demonstration be redirected toward shared discourse, it undermined the curricular hierarchy and threatened to engulf the entire educational canon in an anomalous personalism. In an attempt to mitigate the dissolvent effects of humanist metaphors on the curriculum, Rudolph Agricola, a Rhenish scholar well grounded in the topical tradition, propounded a logic which revived the *loci* and brought them once again into the academic mainstream. But while professing to purify and reclaim logic by differentiating it emphatically from rhetoric, Agricola in fact subsumed the rhetorical places under logic. He eliminated the distinction between probability and demonstration altogether and gave all discourse one simple, clear objective -- to teach.

With Agricola, logic became in fact what Peter of Spain had purported it to be -- "the art of arts and the science of sciences." It spread itself ambiguously over the whole field of discourse, expropriating all the primary functions of rhetoric. "There are no places of invention proper to rhetoric," Agricola declared.<sup>34</sup> They all dissolved into

his "dialectical places" which by definition contained all the objects of human knowledge upon which discourse turned. The Agricolan places had a tremendous impact on dialectical theory.<sup>35</sup> They functioned in a manner substantially more concrete than Aristotelian categories and encouraged visualist analogies between the field of intellectual activity and the objective world. They actually "contained" ideas, conceived as objects susceptible of analysis through spatial arrangement. Agricolan dialectic reflected a simple process of locating ideas or concepts in their places, drawing them out and arranging them methodically in such a way as to convince. Thinking became assimilable to local motion, regulated by a logic which provided an actual "map of the mind" to lead students through the successive steps of invention and judgement which comprised learning.<sup>36</sup> Through the metaphoric mechanisms of the Agricolan places, the entire realm of discourse was made over to *doctrina*.

Because of its peculiar emphasis on didactics, Agricolan place logic had a natural affinity to Protestantism.<sup>37</sup> The reformers identified themselves with teaching in a very profound sense by focusing on the related functions of preaching.<sup>38</sup> They needed to *convince*, to communicate the spirit under the letter which formed the basis of their faith. The vital principle of congregation, which offered mutual reenforcement to a cause adrift in a hostile world, implied the need for communication.<sup>39</sup> Thus



rhetoric became essential to the Protestant cause as a means of persuasively transmitting its perspective on truth. But for the reformers, meaning lay at the instinctive level of life. The empirical logic of Ockham could not penetrate to the truths they sought. They required a logic that could give personal access to spiritual truth and at the same time communicate that truth. The metaphors peculiar to place logic as it had developed in the environment of the Schools proved uniquely suited to their needs. Within the context of topical metaphors, *doctrina* was *scientia*. The "places" made revealed truth a teachable commodity.

Phillip Melancthon adapted the metaphors of Agricolan place logic to the Protestant cause in his treatise, the *Loci communes*.<sup>40</sup> For Melancthon, "clarity was the text of truth."<sup>41</sup> He claimed that the interior organization of any science, including theology, described nothing less than its ability to be taught. Logic did not govern thought as private inquiry. It expressed the method by which the mind identified and communicated truth. It represented an ordering process which terminated in teaching. Logic itself implied communication.

Melancthon used the *loci* as a means to define *doctrina*. The "places" held the truths of the faith. Man penetrated these truths by extracting the essential elements, or "arguments", from their proper places and arranging them methodically in such a way as to make them susceptible of

communication. The method of arrangement provided "a straight or direct way or order of investigating and explaining...[that] pulls out and ranges in order the things pertaining to the matter proposed."<sup>42</sup> In short, method gave access to truth by rendering the "arguments" intelligible -- that is to say, teachable. When viewed through the filter of Melancthon's theological assumptions, method became nothing less than a metaphoric road to redemption.

Although the notion of method had a long history in law and medicine, it first entered the Western logical tradition through Protestant dialectical manuals.<sup>43</sup> Prior to the 16th Century, the word "method" had had no independent reference. It had simply described an ordering activity within the mind attached to other disciplines. In the Schools, method had focused on the organization of curricular subjects, making it highly compatible with Protestant *paedeia*. But although the reformers required a teachable catechism, they sought to convert, not merely to educate. They aimed at Truth, not just knowledge. So they needed to extend the metaphors of method to that realm of certainty ordinarily reserved for formal logic. When the expanded Protestant conception of method joined forces with Agricola's objectified places, a powerful new notion of dialectic emerged in which order guaranteed truth and argument compelled conviction.

Peter Ramus expounded this new logic in a series of dialectical manuals which provoked decades of controversy.<sup>44</sup> Ramus carried the amalgamation of formal and probable logics beyond the "half-conscious blurring" of the humanists and deliberately redefined all discourse in objective terms. He removed the notion of method from its para-logical setting, applied it to dialectic and redefined it as procedure, thereby rendering all discourse a set of formal operations. He effectively neutralized the personalist metaphors of Humanism by occluding the psychological aspects of the rhetorical places and representing both thought and communication as spatial manoeuvres with an economy based in local motion.

Ramism borrowed metaphoric elements from all aspects of the 16th Century intellectual milieu. From the Schools it took a preoccupation with didactics; from the humanists, a concern for communication; from Agricola, an objective theory of predication; and from the Protestants, an expanded view of method. Well blended in the atmosphere of arts scholasticism, this concoction yielded up a dialectic which claimed to provide not only a transcript of the processes of thought, but an actual description of the image of God.<sup>45</sup> Ramism sought a "natural" dialectic which reflected the structure of the mind and the world, a dialectic capable of producing conviction without resorting to psychological or epistemological techniques. In a sense, it sought the scholastics' ideal curriculum -- one

which could teach itself through the simple disposition of its terms.

Like Peter of Spain, Ramus argued that categorical logic arbitrarily imposed "artificial" structures on the natural world of thought. He declared these structures *commentitia* and blamed them for the murky obscurity of scholastic logic. Although the sophistication of his analysis did not prove adequate to his ambitions, Ramus had stumbled here on a fundamental contradiction in scholastic metaphors.<sup>46</sup> Categorical logic originated in a preliminary act of assertion. Its predicates functioned as enunciations or accusations -- personalist, existential statements about the nature of things. Upon this foundation, the scholastics had attempted to construct an abstract, formal logic. The entire realist/nominalist debate over the status and priority of universals turned on issues of correspondence arising out of the attempt to reconcile scientific metaphors of certainty with the assertoric nature of predication.

But place logic originated in a preliminary act of assent -- an unambiguous, shared recognition of "things" in their "places". It procured its premises through "invention", a drawing out of "arguments" from a common body of past experience. Each premise thereby expressed the objective content of a logical locus, not the subjective content of a predicating mind. These discrete concepts remained psychologically neutral and functioned as the objective

building blocks of all discourse. All artificial issues of correspondence disappeared since the metaphors of place logic reduced all priority to the absolute priority in nature itself.

Dialectic, under the operation of topical metaphors, promised to yield a true transcript of reality provided only that the cognizing mind proceed methodically. Ramean dialectic, in fact, operated solely through the machinery of method. Judgement, its second and controlling half, consisted simply in the methodical disposition of terms. Through judgement the mind assembled or arranged cognitional units to reflect a structure which corresponded to the natural structure of the mind and of the world. The process required no psychological explanation. It existed as a function justified through application.<sup>47</sup> The patrimony of the places is patent here. But Peter of Spain had deliberately finessed the extensional implications of his logic, while Agricola had died leaving his treatment of method open-ended and ambiguous. Ramus, on the other hand, explicitly drew the metaphoric implications of topical logic out to their ultimate conclusion. He described a method so comprehensive that logical operations could almost proceed without the aid of thought.

Ramean metaphors clearly reached back to ideas of structure.<sup>48</sup> Moreover they expressed a communal ideal in their desire for an order totally within the ambit of the *conscious* mind.<sup>49</sup> They encouraged no personal retreat into

a private truth, but rather portrayed thought as a shared progression toward a vast orderly arrangement of knowledge which, in its farthest extension, expressed reality. Each cognitional unit, when placed in proper relation to other units, led by minute steps to this perceptible order. The order itself underwrote the places as receptacles of shared knowledge and experience. Method organized that knowledge into an "encyclopedia," a circle of learning embracing human culture in all the richness of its racial past.<sup>50</sup> Moreover, it allowed for the persuasive transmission of this lore to society as a whole. By moving all the principles of organization from rhetoric to dialectic and subsuming them there under method, Ramus tied all discourse to shared experience and made reason virtually synonymous with memory.<sup>51</sup>

This curious dialectic broke on the intellectual scene at a crucial juncture. The Wars of Religion had destroyed all vestiges of a common ideology. Europe now harbored two distinct moralities, two distinct laws, each seeking its own philosophical justification. The invention of printing had reoriented the flow of information and encouraged unprecedented advances through the accumulation and transmission of knowledge.<sup>52</sup> Aristotelean science suffered on all fronts. The new Copernican cosmology shook medieval physics out of the cosy certainty of the crystalline spheres and left it floating in neat but ambiguous orbit around a desacralized nature. By the end of the 16th

Century, Brahe and Diggs had broken the bounds of even the closed Copernican system.<sup>53</sup> By 1640, Kepler had overturned theories of perception by discovering the inverted image of the eye; Galileo had rearranged perspectives through his revolutionary optical theories; and Harvey had reoriented physiology by demonstrating the circulation of the blood.<sup>54</sup>

This mass of new data strained old metaphors to the bursting point. As the radical new cosmogony asserted itself, it became more and more difficult to conceive of the natural world as a symbolic scheme devised by the aesthetic imagination. The new sciences laid nature open to plain view and revealed it as a penetrable and predictable reality, subject to laws and susceptible of analysis. This in turn demanded new principles of logical order capable of guiding the mind in the construction of theory.

To minds dazzled by the rapid influx of raw scientific knowledge, Ramean method offered a preliminary means of control. After all, what better tool to organize an anti-Aristotelian science than an ostensibly anti-Aristotelean logic? Propelled by a burgeoning publishing industry, Ramean method swept through Europe, refashioning everything in its own diagrammatic image. It exercised a controlling influence on European thought well into the 17th Century.<sup>55</sup> Ong even argues that Ramism "mirrors the history of the whole intellectual epoch."<sup>56</sup> Poetry, art, medicine, education, history, law, theology, even the Bible became methodized according to the Ramist canon.<sup>57</sup> The com-

prehensiveness of Ramean method encouraged a faith in the ultimate intelligibility of the newly disclosed universe. This faith generated the self-confidence necessary to approach the unfamiliar cosmos tentatively and to explore it scientifically. Method provided that "straight or direct way...of investigating and explaining" which could bring untested data under manageable rubrics and make it applicable to past experience. It allowed for the assimilation of scientific discoveries, yet maintained a consoling contact with traditional wisdom through the mediating role of the places.

But at the same time, Ramism pointed the way toward a new means of conceptualization capable of processing the vast new data. Scholastic logic had never developed a symbolic system adequate to its formal ambitions. It had no language sufficiently abstract to formulate a general theory of science. The Ramist critique had revealed the insecure semantical foundations of scholastic logic and demonstrated the complete inadequacy of subject-predicate syllogistics to serve as a warrant for science.<sup>58</sup> By contrast, the Ramist tendency to submerge questions of meaning and reference in the places and to represent all logic as spatial manoeuvres independent of psychology loosened up the field of discourse in ways which prepared it to accept a predicate logic of unrestricted generality. Although poorly articulated, Ramism in fact promoted a radical new view of analysis based in the mind's commerce with sensible



nature. Moreover, its naïve emphasis on composite syllogisms created a new, if somewhat ambiguous, role for hypothesis in the construction of scientific models.

Ramism solved the disjunctive with the hypothetical -- that is, it subsumed "either...or" statements and "if...then" statements under the operation of a single composite form. For example, take the disjunctive statement "Either man is dialectical or he isn't." A Ramean would solve it thus:

*Either man is dialectical or he isn't.* (disjunctive)  
*If man is dialectical, then he is rational.* (hypothesis)  
*Man is rational* (a discovery made when the place  
                     "rational" is examined for the term  
                     "man")  
*Therefore he is dialectical.* (a consequence of a  
                                 discovery)

By thus employing a hypothetical to direct the mind in its search through the "places," Ramism gave hypothesis an active role in demonstration, something which traditional syllogistics could not do. Moreover, by linking disjunctives and hypotheticals under the anomalous operation of the composite syllogism, Ramism blurred the absolute distinction between induction and hypothesis which categorical logic drew, thereby providing a logical justification for an analogical approach to the non-quantitative aspects of reality. This ultimately allowed for the extension of mathematical expression across the entire field of discourse.

Ramism appears hopelessly inadequate to minds prepared to reject it by modern mathematical logic. Ong repeatedly emphasizes the deficiencies of its simplistic approach to supposition and its naïve ability to confuse the comprehension and the extension of terms.<sup>89</sup> But despite its unsophisticated nature, Ramean logic had a catalytic effect on minds intent on controlling a mass of new perceptions. The spatial imagery of its places encouraged a drive toward conceiving thought as an operation which took place in an observable field.<sup>90</sup> Its characteristic diagrams reenforced these visualist analogies. They in fact encouraged the development of a quantified medium of communication which neutralized the personalist valence of all logical expression. This drive toward quantification eventually issued in the analytical geometry of Descartes and the abstract matrices of Newtonian space. Ultimately, it underwrote the development of modern mathematical logic itself. But these later logics, however sophisticated, systematically ignored the energizing insight which underwrote the Ramean places. They ignored the Ramists' profound belief in the essentially shared nature of the reality which logic sought to express.

The "clarity" sought through the Ramean places had derived its value from a set of shared conceptions deeply rooted in a common past. But the intellectual advances of the 16th and early 17th Centuries all tended to divorce the world of shared experience from the world of science.

After all, despite what Kepler, Galileo and Harvey might argue, one saw things right-side up; one felt the earth stand still; and the mechanics of circulation rarely intruded themselves in everyday life. These startling new perceptions had no metaphoric reference in that body of common knowledge which underwrote Ramean logic. Indeed, the emerging physical sciences *required* a certain distance from the psychosomatic roots of human consciousness in order to establish the certainty of their abstract formulations. The empathetic knowledge of the places could only serve to contradict their non-experiential hypotheses. As scientific advances gradually replaced the testimony of the senses with abstractions which in many cases had no external reference, consensual knowledge lost its ability to serve as a metaphoric ground for truth. The new man of science, faced with explicating phenomena removed from the world of common-sense, required logical metaphors which could portray concepts not susceptible of extension and generate conclusions guaranteed by the integrity of their own internal structure. In short, he required a logic which aimed ultimately at accuracy, not consensus.

The protean concept of method, lifted from Ramean dialectical manuals and made transcendent, supplied the controlling metaphors for this new dialectic. In Ramist logic, however, method had operated as the controlling principle only in judgement, leaving the mind free in the process of invention to range back across the places in

search of arguments stored for recall. Ramus, in fact, had conceived of method as a limiting concept not unlike what Kant would later call a "regulative principle of pure reason". But Francis Bacon, herald of the new science, passed beyond this regulative principle and enthroned method as both the limit and the ground of inquiry. He expropriated Ramus' three laws of method and installed them as the operative principles in a new apodictic science.<sup>61</sup> No longer willing to accept the places as a viable source of arguments, Bacon placed both judgement *and* invention under the control of method and secured the premises of his logic without recourse to mediation.<sup>62</sup>

In some ways, the humanists' apotheosis of the past had ironically served to retard the advancement of learning. It had promoted a conception of antiquity as the repository of a formerly perfect knowledge. Protestant reform tended to reinforce this view by looking to the Bible as a source of primitive truth. Ramean method had provided a key to unlock and critically process this fund of ancient knowledge. It had even allowed for the assimilation of new data to the patterns of the old. But it had lacked an actual principle of innovation. Bacon, on the other hand, lived in an age of emerging science, an age not only pregnant with change but conscious of it and with a will for it. He conceived of knowledge as incomplete, susceptible of revision and capable of advancement. The new man of science stood at the threshold of discovery. He needed a logic to

carry him forward, not back. Hence Bacon's logic bore no trace of the historical and communal structures essential to Ramism. In fact he labelled these metaphors "idols" and dismissed them as obstacles in the path of knowledge which must be "abjured and renounced with firm and solemn resolution."<sup>63</sup> The advancement of learning could come only through the careful observation of *present* experience processed to yield *new* knowledge.

Bacon outlined his new logic in the *Novum Organum* whose frontispiece graphically portrayed its conceptual orientation, boasting a ship in full sail passing the Pillars of Hercules to explore the seas beyond. The Pillars bore the inscription *plus ultra*. Bacon clearly intended his logic as a means to pass beyond the knowledge of the ancients. The *loci*, as a tool for processing the knowledge of the past, therefore had no "place" in his model. Accordingly he returned them to rhetoric where they resumed their career in somewhat circumscribed fashion.<sup>64</sup> Then, in a crucial shift of metaphors, Bacon redefined Ramean "invention" as first-order discovery, confined its operation strictly to the sciences, and placed it under the control of method. Renamed "initiative," Ramean invention became that procedure which "discloses and lays bare the very mysteries of the sciences."<sup>65</sup> Under Bacon's revised model, the mind "initiated" its premises through induction. From the systematic observation of particular facts, it grouped phenomena under general rules according to the principles

of a method which transcended purely logical application and entered the world of practical affairs as orderly procedure. In a sense, method took on a metaphoric life of its own, replacing consensual knowledge as the structural element in Baconian science.

Bacon's logic promoted a new ideal of natural knowledge as a source of power.<sup>66</sup> Controlled from beginning to end by method, it promised to yield up not only an understanding of nature, but actual control over its elements. Baconian logic contained images of manipulability at its theoretic core. It approached reality in a designedly exploratory way, "vexing" nature with experiments to discover causes which in turn would permit control. According to Bacon neither simple classification nor invention conceived as recall could contribute to the expansion of knowledge. Only careful observation under strict methodological control could direct the mind deeply into the phenomena of nature and guide it in the construction of rules. The metaphors of method, made manifest in Bacon's *Tables of Induction*, provided the key to science.<sup>67</sup> And only science could provide the means to mastery.

Under the impact of Bacon's method, the world of nature faded as the object of man's knowledge, and became rather the object of his will. Under the motto *naturae vincula*, Baconian logic left the Schools and entered the laboratory. It abandoned the search for truth through understanding and meaning through communication and concentrated rather

on obtaining "access to the kingdom of man."<sup>66</sup> Form, as a property of rational unity, gave way to fixed laws as principles of practical operation. "In nature nothing really exists besides individual bodies, performing pure individual acts according to fixed law," Bacon argued. "Yet in philosophy this very law is the foundation as well of knowledge as of operation." This priority of principle over property marked a fundamental shift in logical metaphors which would underwrite technical advances in the applied sciences for the next hundred and fifty years.<sup>67</sup>

But as R. Hooykaas points out, applied science is not the same as experimental science. "Its first aim is ...to gain power over nature [not] to discover its secrets by rationally planned devices."<sup>70</sup> Although Bacon supplied a means for grounding analysis in carefully inducted premises, he provided no metaphoric language for formulating or expressing truly scientific laws. The *Novum Organum* established procedures governing the induction of rules, but offered no means for moving beyond those rules to the construction of axioms. Hence Bacon could understand and appreciate the work of William Harvey, whose observations and experiments advanced anatomical practice, but he completely missed the significance of William Gilbert's daring attempt to explain the cohesion of the universe in one abstract law of magnetism.<sup>71</sup> Driven by a boundless ambition to dominate and exploit the *material* aspects of nature, Bacon, like Ockham, sacrificed the

ability to understand its structure. Moreover, by rejecting all the structural metaphors implicit in Ramean logic, Bacon failed to grasp its latent ability to deal analogically with nature through the language of hypothesis.<sup>72</sup> Challenged by the possibilities of the practical applications of science, he overlooked the extraordinary potential of the mathematical imagination to penetrate the secrets of nature.

Ong repeatedly stresses the "blind drive toward quantification" characteristic of Ramean logic.<sup>73</sup> He argues that the increased use of spatial metaphors proper to topical logic threw it inevitably into a geometric frame.<sup>74</sup> The Pythagorean notion of "proof" allowed for an easy correspondence between geometric display and topical analysis. But Bacon rejected the geometric modes of logic as being proper only to an analysis of form. His logic dealt rather with *phenomena*, with principles of operation not easily amenable to geometric display. In his wholesale rejection of Ramean metaphors, Bacon thus failed to appreciate the unique ability of mathematics to express the variability of phenomena in formal terms. It was left to Descartes, the new apostle of method, to invest the spatial analogies of Ramus with a true mathematical force.

The quantified world was the spiritual home of Descartes and *mathesis universalis* his controlling metaphor.<sup>75</sup> For him all of nature consisted of variables mathematically manipulated. Science comprised merely a body of mathemati-



cal demonstrations aimed at unravelling experience. But the mathematical implications of Ramean logic had drawn on an analogy with matter apart from energy and motion. Kepler's dictum "Where matter is, there is geometry," had expressed its central vision.<sup>76</sup> By contrast, as the new science was rapidly revealing, the world of nature reverberated with contingent, accidental and fundamentally "irrational" phenomena whose infinite variability resisted neat display in geometric form. In fact, nature operated through "curves" -- ellipses, parabolae, hyperbolae -- all vastly more complex than the simple figures of geometry.<sup>77</sup> These "curves" manifested the principle of change inherent in the processes of nature. They corresponded to that active principle, that concern for process, which Bacon had introduced into analysis. But the characteristic inability of Pythagorean images to portray variability made it incapable of expressing these "curves" analytically.<sup>78</sup> Its formal modes of analysis simply could not encompass dynamic principles. Yet the new sciences required a logical and mathematical language which could express not only structure, but motion.

Descartes supplied this vocabulary in a revolutionary algebraic conception of thought. "Give me extension and motion and I will construct the world," he proclaimed, his Archimedean rhetoric exemplifying the shift away from Pythagorean metaphors.<sup>79</sup> In an historic mathematical insight, Descartes saw that he could represent curves --

the mathematical correlative of process -- algebraically by treating the primary qualities of matter as mathematical rather than geometric entities. He saw that by substituting algebraic symbols for the extensive properties of objects he could construct a mathematical language without recourse to diagrams. He could thereby extend the metaphors of method to that confusion of matter in motion that comprised the world of natural phenomena.

By incorporating principles of motion into method, Descartes carried logical analysis a giant step beyond the diagrammatic boundaries of Ramism. Cartesian proofs could represent ongoing processes and, by reference to a co-ordinate frame, relate them to the material world. By conflating the physical and mathematical sciences, Descartes provided a means for analyzing all physical phenomena in terms of the specifiable properties of matter in motion. But by assimilating physical nature to mathematical analysis, Descartes also created a new role for logic and for the mind which pursued it. *Mathesis universalis* operated through universal rules. Yet these rules had no formal reality -- Bacon had effectively dispensed with that. They merely articulated the rational constructions of an inquiring mind which, as the architect of rules, took on a new relationship to the nature it sought to explicate. Under Cartesian metaphors the mind became more than simply the seat of inquiry. It assumed a new role as the author of a world which, by authoring, it explicitly reduced to the

condition of object. By insisting on the deductive relations of mathematics as the controlling metaphors of science, Descartes created what Balz has called the "anthropocentric predicament"<sup>80</sup> -- a logical impasse which placed the mind in control of a natural world deduced exclusively from its own postulates.

Made manifest in the *cogito*, this "anthropocentric predicament" became the controlling principle of Cartesian logic. The *cogito* expressed a new set of logical metaphors which rendered the subject the vanishing point of a world reduced to mathematical expression. Under this new principle of order, inquiry became a process pursued through method but guaranteed through self-consciousness. For if all logical discourse expressed mathematical relations and all mathematical relations expressed rational constructions, a self-validating mind must function as the ground of inquiry. The *cogito* thus represented the final stage in the effective isolation of logical metaphors from the world of shared discourse. With it the increasingly apparent alienation of the world of science from the world of sense became a logical principle.<sup>81</sup>

The *cogito* underwrote a logic whose predicates expressed, not outward assertions or a shared assent, but simple acts of mental vision -- actual psychological events grounded in a self-reflecting ego. Ramean predicates had derived from invention and reached back to a common past. Baconian predicates had derived from initiation and reached

out to present experience. But Descartes isolated predication within the cognizing mind. His predicates originated in *intuition*, the "undoubting conception of an unclouded and attentive mind" which reconstructed the entire world of common experience from its own perspective. Cartesian predicates carried no imperative to convince by conforming themselves to a shared reality since they sprang "from the light of reason alone."<sup>82</sup> Indeed, they stood intuitively prior to inquiry itself and served only as witness to an inner world of self-consciousness from which all other worlds methodically derived.<sup>83</sup>

"My design has never extended beyond trying to reform my own opinion," Descartes declared, effectively isolating his logic from any metaphoric concern with communication.<sup>84</sup> In fact, in the *Discourse*, Descartes explicitly identified the act of communication with the "adulteration" of ideas. The "undoubting conceptions" grasped through intuition functioned prescriptively, not descriptively. They expressed dehistoricized truths which derived their authority from the immediacy of present experience and implied a profound disregard for contextual concerns.<sup>85</sup> Descartes' "clear and distinct ideas" in fact remained totally unencumbered by any genealogy in a common past.

From the point of view of a nascent science, this proved a great advantage. The ability to isolate immediate experience from its contextual base allowed scientists to consign to the realm of psychology all those phenomena

extraneous to the formulation of physical laws. Under Cartesian analysis, scientists could ignore secondary qualities except insofar as they could be reduced to analytical referents. They could thereby construct theoretical systems that were sufficiently abstract to absorb new data. They could even lay claim to new knowledge through the manipulation of mathematical formulae. But because of the psychological ground of their logical premises, they could never reach outside their own theoretical frame to that body of shared experience which had supported the topical tradition.

The *cogito* established logic in a trajectory which carried it inevitably away from the world of shared consciousness which had underwritten the "places.". It redefined the predicating mind as a uni-valent ego in whom ground and consequent merged. It transformed dialectic from a function immersed in a world of common experience to a method of procedure restricted to the individual mind. Mediating language structures gave way to a new analytic vocabulary based in mathematics which could express abstract relationships without any existential reference. As the natural world became more and more the object of purely private inquiry, logic lost its voice -- the metaphorical harmony of the symbolist spheres fading into the silent object world of Newtonian space.

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CHAPTER NOTES

1. For Christian social theory, see particularly Augustine's City of God. For specific treatments of Augustine's impact on Christian social theory see J. N. Figgis, The Political Aspects of St. Augustine's City of God (Gloucester, 1963); R. A. Markus, Saeculum: History and Society in the Theology of St. Augustine (Cambridge, 1970); H. A. Deane, Political and Social Ideas in St. Augustine (New York, 1963); P. R. L. Brown, Religion and Society in the Age of St. Augustine (New York, 1972). For general treatments see M.-D. Chénu, Nature, Man and Society in the 12th Century (Chicago, 1957); R. W. Southern, The Making of the Middle Ages (New Haven, 1953); Etienne Gilson, The History of Christian Philosophy in the Middle Ages (New York, 1955).

2. Johan Huizinga uses the rich image of a fugue to represent the essential complexity of the medieval social order (The Waning of the Middle Ages, (New York, 1954), 38). Dom Jean Leclercq calls it "the culture of a milieu", a culture which turned in upon itself (The Love of Learning and the Desire for God (New York, 1961), 198). Carolyn Bynum characterizes it as a consciously chosen community. "Turning inward to explore motivation," she argues, "went hand in hand with the sense of belonging to a group which not only defines its own life by means of a model but also was itself - as group and as pattern - a means of salvation and of evangelism" ("Did the Twelfth Century Discover the Individual?," Journal of Ecclesiastical History 31 (1980):14-16). Garrett Mattingly marvels at the conceptual coherence achieved by medieval society in describing the force and ubiquity of the *jus gentium* which governed the relations of individuals and public authorities within this "commonwealth of Christendom" (Renaissance Diplomacy (Harmonsworth, 1955), 271). Likewise, Marc Bloch describes medieval society as a "fabric" and defines feudalism as an institution distinguished by its interdependent relationships (Feudal Society (Chicago, 1961)). Richard Trexler has described this same communal orientation in its public aspects in Public Life in Renaissance Florence (New York, 1980).

3. Huizinga, Waning, 205.

4. For insightful treatments of medieval science see H. O. Taylor, The Medieval Mind (New York, 1919); Frederick Artz, The Mind of the Middle Ages: A. D. 200-1500 (Chicago, 1953); C. H. Haskins, Studies in the History of Medieval Science (Cambridge, 1924); Lynn White, Medieval Technology and Social Change (London, 1962). E. A. Moody,

Studies in Medieval Philosophy, Science and Logic  
(Berkeley, 1975).

5. Huizinga, Waning, 213.
6. Moody, Studies, 374.
7. For general treatments of realism in Medieval thought see W. Kneale, The Development of Logic (Oxford, 1962); Etienne Gilson, The History of Christian Philosophy in the Middle Ages (New York, 1955); Maurice DeWulf, Philosophy and Civilization in the Middle Ages (New York, 1953); Frederick Copleston, A History of Philosophy (New York, 1962), vol. 2.I and vol. 2.II; Meyrick Carré, Realists and Nominalists (London, 1946).
8. For a detailed description of the linguistic aspects of medieval logic and its relationship to rhetoric see Moody, Studies (Berkeley, 1975) and Truth and Consequences in Medieval Logic (Amsterdam, 1953); Artz, Mind of the Middle Ages and H. O. Taylor, Medieval Mind.
9. See Walter Ong, Ramus, Method and the Decay of Dialogue (Cambridge, 1958) and Rhetoric, Romance and Technology (Ithaca, 1971).
10. Moody, Studies, 374.
11. Ong observes that "what psychologically differentiates a topical classification from a categorical classification...is the fact that the supreme genera or classes themselves are thought of not in a concept which echoes, however faintly, an auditory approach to knowledge, but rather in a concept formed on exclusively visualist, spatial analogies" (Ramus, 112). For an analysis of topical logic and its implications see Ong, Ramus, 65-91, 93-129.
12. see Leclercq, Learning, 250-255 for a discussion of medieval exegesis and how the *florilegium*, the *collatio*, and the *lectio* shaped patterns of analysis. See also Southern, The Making of the Middle Ages.
13. Walter Ong describes the quiet revolution which occurred with the advent of topical logic: "Unlike the Topics in the Organon, Peter of Spain's treatise on the topics contains no clear indication that it treats of probabilities only. It is not explicitly disengaged from the other parts of logic concerned with scientific demonstration. The treatise is presented as an integral part of Peter's dialectic precisely because Peter persistently blurs the question whether this dialectic is an instrument of scientific certainty, of mere probability, or of both together... The key word in Peter's explanation of *ratio* is thus not truth at all, but confidence or trust

(*fides* - understood as the rhetorical and dialectical term, not the theological virtue)... It is a way of getting at truth which is sure, common sense, and by implication and association, thoroughly scientific; but when actually pinned down to explanation, somehow it is only instinctive" (Ramus, 60, 65). For a discussion of the impact of the *logica moderna* see J. P. Mullaley, The Summulae Logicales of Peter of Spain (Notre Dame, 1945).

14. Ong goes so far as to say that "in the Middle Ages Peter of Spain's logic was logic" (Ramus, 93).

15. See Ong, Ramus, 70-91 for a description of the pedagogical effects and the psychological implications of this "logic in space".

16. Ibid., 131-144.

17. For a narrative of this assimilation process, see Moody, Studies, 370-380; see also Fernand Steenbergen, Aristotle in the West: The Origins of Latin Aristotelianism (Louvain, 1955); Philotheus Boehner, Medieval Logic: An Outline of Its Development from 1250 - c.1400 (Chicago, 1952).

18. For Aquinas on the *compositum* see the Summa theologiae, I, Questions 75-89. Arguments here are drawn from Basic Writings, trans. Anton C. Pegis (New York, 1945), vol. I.; F. D. Wilhelmsen, Man's Knowledge of Reality: An Introduction to Thomistic Epistemology (Englewood Cliffs, 1956); P. O. Kristeller, Medieval Aspects of Renaissance Learning (Durham, 1974). For the treatments of Aquinas most relevant to the present argument see Etienne Gilson, The Philosophy of St. Thomas Aquinas (London, 1937) and Le Thomisme (Paris, 1944); P. Rousseault, The Intellectualism of St. Thomas (London, 1935); Meyrick Carré, Realists and Nominalists (London, 1946).

19. For Scotus on the nature of material reality see the Ordinatio. Arguments here are drawn from "Concerning Metaphysics", "Concerning Human Knowledge", and "The Spirituality and Immortality of the Human Soul" in Duns Scotus: Philosophical Writings, trans. A. B. Wolter (Indianapolis, 1962), 1-15, 103-121, 141-173. For an exhaustive treatment of these issues in the Quodlibetal Questions, see C. R. S. Harris, Duns Scotus (New York, 1959), 2 vol. For general treatments of Scotist philosophy see E. A. Moody, Truth and Consequences; E. Bettoni, Duns Scotus: The Basic Principles of his Philosophy (Washington, 1961); M. J. Grajewski, The Formal Distinction of Duns Scotus (Washington, 1944).

20. For Ockham on epistemology and logic see the Expositio super viii libros physicorum and the Summa totius logicae. Arguments here are drawn from Ockham:



Philosophical Writings, trans. P. Boehner (Indianapolis, 1964). For an exhaustive treatment of logical issues in Ockham see Gordon Leff, William of Ockham: The Metamorphosis of Scholastic Discourse (Manchester, 1975); P. Boehner, Collected Articles on Ockham (New York, 1956); E. A. Moody, The Logic of William of Ockham (New York, 1935) and Truth and Consequences.

21. Ockham substituted a physiological for a psychological explanation of memory. For Scotus, as for Augustine, memory had retained a metaphysical status as a separate source of awareness which had tied the cognizing individual to a coherent frame of reference. For Ockham, on the other hand, memory had no status. He assimilated it to simple cognition through the agency of environmentally dependent habits. The ordering of experience thus followed rather than preceded the act of cognition. For Ockham on habit see O. Fuchs, The Psychology of Habit According to William of Ockham (New York, 1952). For Scotus on memory see Harris, Scotus, 249-305. For Augustine on memory see Confessions, Bk.X, ch. 8-34, 217-243.

22. Stephen Ozment, "Mysticism, Nominalism and Dissent" in The Pursuit of Holiness in Late Medieval and Renaissance Religion, ed. Trinkhaus and Oberman (Leiden, 1974), 92. For an excellent treatment of some of the broader consequences of Ockhamist thought see Heiko Oberman, The Harvest of Medieval Thought (Cambridge, 1963).

23. Ockham's terms bear a striking resemblance to the "loci" in their ability to group experiential facts under rubrics to allow for "judgement". The ability, indeed the necessity, to conceive individual existents in extension in order to operate logically upon them reflects the tendency in place logic to "fix" concepts in the external world. But Ockham removed all the contextual supports from Peter's places, isolating them from shared experience.

24. Gordon Leff sees the shift in emphasis as "the physical counterpart of the logical distinction between predication and signification through which...Ockham was able to demetaphysicise the predicables and the categories and all other attributes" (Medieval Thought (Chicago, 1958), 562). E. A. Synan agrees, pointing out the fundamental dependence of science on logical theory. "When a logician explains the universal," he warns, "the fate of science...is at stake" (C. G. O'Neill, An Etienne Gilson Tribute (Milwaukee, 1959), 308). And in fact, terminist logic did provide a new conceptual base for objective science. Witness the advances made in kinematics by nominalist thinkers (Moody, Studies, 317, 445-451). For summaries of the general scientific developments of the period see Boas, Scientific Renaissance; W. P. D. Wightman, Science and the Renaissance: An Introduction to

the Emergence of the Sciences in the 16th Century (New York, 1962); Elizabeth Eisenstein, The Printing Press as an Agent of Change (Cambridge, 1979).

25. Gordon Leff points out that "the most striking lacuna [in Ockham's theory of knowledge] is the absence of any adequate consideration of mathematics." This inadequacy, a consequence of the emphasis placed on experience, resulted in an incomplete account of self-evident knowledge which effectively diminished the number and type of propositions acceptable as premises in demonstration. The primacy given to natural experience confined nominalist thought to investigations occurring within the perceptual realm -- a limitation which only mathematics could transcend. "It would therefore be misconceived," Leff argues, "to see the change to a more scientific attitude as having come through the displacement of Aristotle for a new naturalism with Ockham as the agent" (Thought, 564-565). Moody agrees, calling any attempt to locate the origins of a general science in nominalist thought "an illusion, and an anachronistic fiction, which we are able to construct only because Galileo and Newton gave us the pattern by which to select the right pieces and put them together" (Studies, 408).

26. As C. H. Haskins points out, "Apply the nominalistic doctrine to God, and the indivisible Trinity dissolves into three persons. Apply it to the Church, and the Church ceases to be a divine institution with a life of its own and becomes merely a convenient designation for the whole body of individual Christians. Apply it to the State, and where does political authority reside, in a sovereign whole or in the individual citizens?" (The Renaissance of the 12th Century (Cambridge, 1971), 352); see also Oberman, Harvest.

27. Trexler charts the devolution as a change from communal to charismatic leaders (Public Life, 262-278). Anthony Molho represents it as a failure of "the secular ideal of [the] progress of mankind through the diffusion of decency and learning" (The Social and Economic Foundations of the Reformation (New York, 1969), 112). Frederick Artz places it in an even wider context. "In the long run," he claims, "Ockham's system...became the natural ally of individualism as against group control" (Mind, 269c). It pulled the last shaky supports from the crumbling communal structures of medieval life.

28. Richard Trexler argues that the breakdown of the medieval community had the effect of distancing the individual from the group. He became isolated from the sources of power and settled into a more passive role which created opportunities for the rise of oligarchs and tyrants (Public Life, 9-45). Colin Morris takes a more positive view, seeing the breakdown as the breeding ground of a new self-

confidence and assertive attitude (Discovery, 167). Whether one chooses to label it isolation or independence, a new awareness of conflict and change forced the individual into a posture which required that he make his own decisions. No longer supported by the props of traditional authority, he had to seek stability in a society whose established order had fallen. Mattingly sees the resulting social forms as "a functional adaptation of the new type of self-conscious, uninhibited, power-seeking, competitive organism" (Diplomacy, 58).

29. For treatments of humanism and its rhetorical emphasis see Eugenio Garin, Italian Humanism: Philosophy and Civic Life in the Renaissance (Oxford, 1965); Ernst Cassirer, The Individual and the Cosmos in Renaissance Philosophy (New York, 1964); P. O. Kristeller, Renaissance Concepts of Man (New York, 1972); D. O. MacNeill, Guillaume Budé and Humanism in the Reign of Francis I (Geneva, 1975).

30. Ong, Ramus, 101.

31. Petrarch, "On His Own Ignorance" in The Renaissance Philosophy of Man ed. Ernst Cassirer, et al (Chicago, 1948), 60.

32. Walter Ong develops this argument in Rhetoric, Romance and Technology: Studies in the Interaction of Expression and Culture (Ithaca, 1974).

33. Paul Oscar Kristeller goes so far as to say that humanism in fact expressed only a phase in the rhetorical tradition of Western culture ("The Humanist Movement" in Renaissance Thought (New York, 1961). In as much as the humanists claimed communication as their ideal, he may be correct. Certainly the humanists demanded that all logical demonstration be redirected toward shared discourse. Lorenzo Valla declared an open hostility to the empty categories of that "peripatetic tribe" who destroyed natural meaning through the imposition of arid distinctions and arbitrary terms. Logicians had forgotten the human significance of discourse, he argued. Dialectic "depends not on reason but on example...not on law but on custom." The humanists insisted on the inseparability of eloquence and wisdom, the impenetration of language and thought. Like Peter of Spain, they demanded relevance, but a relevance grounded in humanity, not ontology. (For Valla on logic see the De dialectica. Arguments here are drawn from Kristeller, Medieval Aspects; Cassirer, Philosophy of Man. For a specific treatment of Valla with reference to educational reform see D. R. Kelley, The Beginning of Ideology: Consciousness and Society in the French Reformation (Cambridge, 1981), 131-143).

34. For Agricola on logic see De inventione dialectic-

tica. Arguments here are drawn from Ong, Ramus, 92-131 which treats Agricola in specific relation to both Peter of Spain and Peter Ramus. These two passages are quoted in Ong, Ramus, 101.

35. Ibid., 123-130.

36. The image of a "map of the mind" appears explicitly in *The Pilgrimage to Parnassus*, one of a series of plays coming out of Cambridge satirizing educational practices in general and Ramist practices in particular (Ong, Ramus, 195).

37. See Stephen Ozment, "Humanism, Scholasticism and the Intellectual Origins of the Reformation" in Continuity and Discontinuity in Church History, ed. Church and George (Leiden, 1979), 133-149. See also D. R. Kelley, The Beginning of Ideology; J. M. Kittleson, "Humanism and the Reformation in Germany" Central European History 9(1976):303-322; J. T. MacNeill, The History and Character of Calvinism (New York, 1954); Bernd Moeller, The Imperial Cities and the Reformation (Philadelphia, 1972).

38. Kelley describes how the Protestant emphasis on teaching emerges in the unique concept of *paedeia* which equated learning with spiritual growth. Although for the purposes of the present argument this concept is most telling in its Protestant guise, it should be noted that a parallel concept emerged in Catholic thought in the *consensus Ecclesiae* of Erasmus and More (Kelley, Ideology, 150-159). See also Ozment, "The Intellectual Origins..." in Church and George, Continuity.

39. Calvin had explicitly enjoined the Visible Church to communicate its faith through stewardship and teaching (Institutes of the Christian Religion (Indianapolis, 1957), Book IV, 98-126).

40. For Melancthon on logic and method see the Loci communes. Arguments here are drawn from Melancthon on Christian Doctrine: Loci Communes 1555, ed. C. L. Manschreck (New York, 1965). For general treatments, see Manschreck, Melancthon: The Quiet Reformer (Westport, 1963); Ong, Ramus, 236-245; J. D. Tracy, "Humanism and the Reformation" in Reformation Europe: A Guide to Research, ed. Stephen Ozment (St. Louis, 1982), 33-57.

41. Tracy, "Humanism..." in Ozment, Reformation Europe, 44.

42. Quoted in Ong, Ramus, 237.

43. Ibid., 158-160, 226-235. Ong comments, however, that 'logical' method has no real honest ancestry at all in scientific logic. The order for which it campaigns turns

out to be, historically and in reality, the order followed in organizing a literary composition, hybridized, by an afterthought, with certain semilegitimate offspring of logic and medicine. 'Method' thus puts in its most decisive appearance in the history of thought not where logic is most strict, but precisely where the line between the residual logic of the humanists and their rhetoric is least distinct" (Ibid., 307). For a discussion of some of the early appearances of the notion of method in humanist writings see Wilbur S. Howell, Poetics, Rhetoric and Logic (Ithaca, 1875), 154-161. See also N. Gilbert, Renaissance Concepts of Method (New York, 1970).

44. Ramus' first dialectical writings appeared in 1543 (*Training in Dialectic and Remarks on Aristotle*), but these were followed throughout his career by revisions of his theories in response to controversy. His two major dialectical manuals appeared in 1555 and 1556 (Ong, "Ramus in Intellectual Tradition" and "Vectors in Ramus' Career" in Ramus, 3-16, 17-35). For a treatment of the controversies surrounding Ramean dialectic see Ong, Ramus, 214-224. For a comprehensive bibliography of all Ramean editions see Ong, Ramus and Talon Inventory (Cambridge, 1958) which also contains an exhaustive survey of the literature generated by the major Ramean controversies (Inventory, 492-534).

45. For Ramus on logic and rhetoric see his Dialectique and the Arguments in Rhetoric Against Quintillian. Arguments here are drawn from the 1555 edition of the Dialectique (Genève, 1964), a facsimile edition of the 1574 English edition of The Logike of the moste excellent philosopher P. Ramus Martyr (New York, 1969), and The Arguments in Rhetoric Against Quintillian, trans. Carole Newlands (DeKalb, 1986). The most comprehensive treatment of Ramean logic and its implications is found in Ong, Ramus and its companion volume the Inventory. For interesting but peripherally focused treatments, see Perry Miller, The New England Mind: The Seventeenth Century (New York, 1939); Hardin Craig, The Enchanted Glass: The Elizabethan Mind in Literature (New York, 1936); Howell, Logic and Rhetoric. See bibliography for additional materials on Ramus in relation to specific issues.

46. Ong, Ramus, 44-47; 104-112.

47. "An art," Ramus declared, "is known not so much by precepts as by exercise...[which] will make clear what calm reflection, no matter how discerning, cannot understand" (Ong, Ramus, 193). For a discussion of the practical aspects of Ramean rhetoric see Howell, Logic and Rhetoric, 173-247.

48. Ong argues that the "places" in fact represented an "oral residue" of the drive in earlier cultures to group

knowledge and experience around consensual images (The Presence of the Word: Some Prolegomena for Cultural and Religious History, (New Haven, 1967), 79-87).

49. Through the objective bias of the places, psychology and epistemology both dissolved into method in what Ong calls the "expropriation of the unconscious by consciousness" (Ong, The Interfaces of the Word: Studies in the Evolution of Consciousness and Culture (Ithaca, 1977), 207).

50. "The symbolic significance of the circle," Leroy Loemker points out, "is that the lines of thought drawn from the circumference of our total knowledge converge upon a center, i.e. the common disciplines of dialectic and metaphysics. ...The inferior disciplines depend on both. ...Metaphysics imparts certainty to them, logic imparts order. ...The resulting circular motion is perfection." Loemker argues further for the Neo-Platonic roots of the "encyclopedia" "in these overlapping *a priori* and *a posteriori* perspectives within the total unity of the *Encyclopedia*" ("Leibniz and the Herborn Encyclopedists," Journal of the History of Ideas 22 (1961):326). See also "The Old Studium and the New Learning" in Kelley, Ideology, 136-143.

51. Ong notes that "the memorization process for Ramus is virtually synonymous with understanding itself, to the extent that the success of the Ramist dialectic as a memory device proves the validity of the dialectic as a true interpretation of reality" (Ramus, 194).

52. See Eisenstein, Printing Press.

53. For general treatments of the radical changes in the physical sciences see Eisenstein, Printing Press; Boas, Scientific Renaissance; Thomas Kuhn, The Copernican Revolution: Planetary Astronomy in the Development of Western Thought (Cambridge, 1957).

54. Kepler advanced his theories of perception in *Astronomiae pars optica* (1604). Galileo's optical theories appeared in *Sidereus nuncius* (1610), while his famous treatments of astronomy appeared in the renowned *Dialogue* (1630). Harvey's physiological discoveries appeared in *De motu cordis* (1628) and *De generatione animalium* (1651).

55. Howell, Logic and Rhetoric, 7-9; Ong, Ramus, 3-16, 295-307.

56. *Ibid.*, 27.

57. Ramist method shaped poetic theory in England throughout the 17th Century. The works of John Milton and Edmund Spenser are prime examples of "methodized" poetry

(see Rosemund Tuve, Elizabethan and Metaphysical Imagery (Chicago, 1947) and "Imagery and Logic: Ramus and Metaphysical Poetics," Journal of the History of Ideas, III (1942):365-400); Howell, Logic and Rhetoric). Ramist influence was equally strong in France and on the continent (see Kees Meerhoff, Rhétorique et poétique au XVI<sup>e</sup> siècle en France: DuBellay, Ramus et les autres (Leiden, 1986)). For a treatment of visual imagery during this period see E. M. W. Tillyard, The Elizabethan World Picture (New York, 197-). In medicine, pharmacology was methodized by Andreas Libau (1560-1616) in his *Alchemia* (see Lynn Thorndike, "Libavius and Chemical Controversy," in History of Magic and Science (New York, 1941). Predictably, education felt the strongest influence from method. Johann Heinrich Alsted (1588-1670), an arch-Ramist, presented his method of logico-mnemonic in his *Encyclopaedia* (1630). John Amos Comenius (1592-1670) applied Ramist principles to an educational reform which effected all parts of England and the continent. His *Pansophiae* (1643) presented a model for "universal learning" (see J. E. Sadler, J. A. Comenius and the Concept of Universal Education (London, 1966). Jean Bodin methodized the study of history in his Method for the Easy Comprehension of History (1566) (see J. H. Franklin, Jean Bodin and the 16th Century Revolution in Methodology of Law and History (New York, 1939). Johannes Althusius (1557-1638) systematized political theory in his *Politica methodice* (1603) which claimed to treat all forms of human association (see O. F. von Gierke, The Development of Political Theory (New York, 1939). Bartholomew Keckermann (1571-1609), a "mixt" Ramist, brought all of theology and natural philosophy under method in his *Praecognita* (1616) and his *Systema physicum* (1610), while Johannes Piscator (1546-1625) went one step beyond Keckermann and methodized the Bible itself (see Ong, "Johannes Piscatore: One Man or a Ramist Dichotomy?" Harvard Library Bulletin VIII (1954):151-162. See also discussions in Chapter 2 of Ramus bearing on the diffusion of Ramism). Although a substantial Aristotelian party remained, Ramism had sufficient influence to keep them always on the defensive (see Howell, Logic and Rhetoric, 282-342; Ong, Inventory, 492-534).

58. Moody, Studies, 387-390.

59. Ong discusses this aspect of Ramean logic in relation to later mathematical logics, but concludes that "his management of the syllogism is devoid of any valuable and effective insights...[and that] the quantifying approach into which he strays is...the result of loosely organized mental habits acquired in the Parisian milieu and made somewhat more 'simple' or crude by the Agricolan influence" (Ong, Ramus, 185-186). Moreover, Ong claims that Ramus continually falls back on "a specially rigged terminology which protects him from refutation only by total mystification" and argues further that "the Ramist dialectic manifests a quantification system which is almost certainly

the most recklessly applied one that the world has ever seen" (Ibid., 260, 203).

60. Ong is fascinated by the progressive visualization of thought implicit and explicit in Ramean logic, linking it to Copernican cosmology and drawing elaborate analogies between the mechanics of printing, which "fixed" the spoken word in a spatial matrix, and the Ramean drive toward quantification ("Ramism and Printing as Related Epiphenomena" in Ramus, 307-314 and "Closure and Print" in Interaces, 147-189). See also Eisenstein, Printing Press, 65-80.

61. For a description of Ramus' three laws see Ong, Ramus, 258-260.

62. For an interesting discussion of the relationship between Ramean and Baconian methods see Craig Walton, "Ramus and Bacon on Method," Journal of the History of Philosophy 10 (1972):289-302. Walton argues that, despite most scholarly opinion, there were distinct ties between Bacon and Ramus in their application of method.

63. Francis Bacon. Novum Organum, ed. F. H. Anderson (Indianapolis, 1960), I, i, 68. The "Idols", briefly sketched in the Advancement of Learning (II, xiv, 9-12), are fully elaborated in the Novum Organum I, i, 41-65. For discussion of the Idols see Gilson, Modern Philosophy, 32-36.

64. For Bacon on rhetoric see Howell, Poetics, 78-86 and Logic, 371-372. See also Walton, "Bacon and Ramus...", 300-301.

65. Francis Bacon, De dignitate et augmentis scientiarum in The Works of Francis Bacon, ed Spedding, Ellis and Heath (London, 1857-1874), II, 449. For Bacon's use of invention in the Ramist sense see Novum Organum, Preface; I, viii; I, cxxix. For a discussion of Bacon's method with relation to Ramean invention see Walton, "Bacon and Ramus...", 290-297; Howell, Logic, 367-370.

66. Bacon, De augmentis, II, 2. For a discussion of the relationship of Bacon's ideal of mastery with the Protestant doctrine of success see Hardin, Glass, 140-141. Edgar Zilsel ties this relationship directly to the rise of the "physical law" metaphor ("The genesis of the Concept of Physical Law," Philosophical Review 51(1942):262-266. For a similar treatment see also Hooykaas, Religion and the Rise of Modern Science (Edinburgh, 1972), 71-75.

67. Bacon present his Tables of Induction in the Novum Organum, II, ii, 15. These "tables" of presence, absense and variation reappear in Hobbes and finally, in modified form, in John Stuart Mill. For a discussion of their



influence on the development of inductive logic see Gilson, Modern Philosophy, 30-43.

68. Bacon, *Novum Organum*, I, xiv, lxviii.

69. Ibid., II, iii, 122. For a discussion of Bacon's tendency to give priority to principle over form which ties it directly to Ramean method see Walton, "Bacon and Ramus...", 298-301. See also Gilson, Modern Philosophy, 35-42.

70. Hooykaas, Religion, 75. Hooykaas presents an in depth discussion of "The Evaluation of Manual Work and Experimentation" which ties these issues directly to the development of modern science (Religion, 76-87). Hans Jonas places a similar discussion in the context of "The Scientific and Technological Revolution" in his Philosophical Essays (Englewood Cliffs, 1974), 45-81. D. M. Clarke discusses the distinction with relation to Descartes' philosophy of science in "Experiments and Ordinary Experience" in Descartes' Philosophy of Science (University Park, Pa., 1982), 30-47.

71. Gilson, Modern Philosophy, 35-37, 43.

72. Bacon had rejected the places of Ramean logic while maintaining its preoccupation with a concrete means of conceptualization. The major difference between the two logics lay in the fact that Ramus grounded his concepts in past experience through reference to the *loci*, while Bacon grounded his exclusively in the present. Ramus guaranteed his logic through structure; Bacon guaranteed his through method -- but a method which could not step outside the verifiable effects of present experience. He therefore missed the significance of any analogical approach to science.

73. Ong, Ramus, 188, 78-passim.

74. Ong maintains that a "drift toward visualism" is a natural consequence of the spatial economy of the places. He ties this to the general "scientizing impulse" of the 17th Century, the advent of printing and to a general move away from an oral-aural culture grounded in community to a visualist universe grounded in the individual (Ramus, 108-116, 307-314; Interfaces of the Word, 121-135). See also Collin Turbayne, The Myth of Metaphor (Columbia, S. C., 1962), 141-145.

75. For *mathesis universalis*, see the Regulae, rule 4 in Oeuvres de Descartes, ed. Charles Adams and Paul Tannery (Paris, 1964-74), vol. X, 377-8.

76. From the *De fundamentis astrologiae certioribus* (1601), thesis XX quoted in Hooykaas, Religion, 35.

77. For a discussion of the differences in the mathematical models needed to represent these curves see Bell, Newtonian Science, 103-105.

78. Bell, Newtonian Science (London, 1961), 45-48.

79. *Le Monde*, chapter iv in Adams, Oeuvres, vol. XI, 16-23. For a discussion of this shift in metaphors see Turbayne, Myth, 67-69.

80. A. G. A. Balz. Descartes and the Modern Mind (New Haven, 1952), 348.

81. For the most relevant general treatments among the massive literature on Descartes see L. J. Beck, The Method of Descartes: A Study of the Regulae (Oxford, 1952); D. M. Clarke, Descartes' Philosophy of Science (University Park, 1982); A. G. A. Balz, Descartes and the Modern Mind (New Haven, 1952); H. Caton, The Origins of Subjectivity: An Essay on Descartes (New Haven 1973); J. J. Katz, Cogitations: A Study of the Cogito in Relation to the Philosophy of Logic and Language... (New York, 1986); Etienne Gilson, Etudes sur le rôle de la pensée médiévale dans la formation du système Cartésien (Paris, 1951); E.-E. Saisset, Précurseurs et disciples de Descartes (Paris, 1862); Weinburg, Occam, Descartes and Hume: Self Knowledge, Substance and Causality (Madison, 1977).

82. Adams, Oeuvres, vol. X, 368. For an interesting analysis of the logical status of the *cogito* see Katz, Cogitations. Katz discusses the *cogito* as an "analytical entailment," formally valid without subsumption under the laws of either logic or mathematics.

83. Descartes' logic conformed to the exigencies of reason, not to an existential order. The knowledge which flowed from the *cogito* consisted of implied propositions deduced from self-evident mathematical principles. As such it could guarantee objective analyses provided only that the mind not violate the rule of clarity or deviate from the path of method. In this logical scheme "clarity" became a purely personal criterion for private inquiry. In fact, as Etienne Gilson points out, Descartes proved unable to formulate the *cogito* in broad logical terms (Modern Philosophy, 56). His first attempt, in the *Regulae*, remained unfinished and represented more a propaedeutic to a future logic than an actual logical treatise. Ultimately, Descartes articulated the *cogito* in the *Discourse on Method* which functioned as a spiritual autobiography, not a formal logical theory. It contained Descartes' personal prescription for reconstituting his own knowledge in a natural world robbed of its formal reality.

84. Adams, Oeuvres, vol. VI, 4.

85. Ibid., vol. VI, 69. For a discussion of the isolating tendencies of Cartesian logic see Dalia Judovitz, Subjectivity and Representation in Descartes (Cambridge, 1988).

Chapter 2  
LAW AND ORDER IN THE OLD WEST

Logical Metaphors  
in  
European Legal Models

The shift in metaphors implicit in Cartesian analysis marked a critical moment in the history of logic and the development of science. It introduced a new principle of logical order which in turn supplied a metaphoric foundation for a new conception of scientific law. The accession of the subject to a prescriptive role in inquiry redirected logic away from mediational forms and refocused it firmly on a specifiable and totally accessible reality. The Cartesian subject himself authored the world he explored according to the dictates of his own clear and distinct ideas. These ideas retained none of the structural elements which had survived in the Ramean places. Nor did they reflect any lingering attachment to the humanist ideal of communication. As private acts of vision, they underwrote a formulation of knowledge whose validity preceeded all contextual concerns. In what Karsten Harries has called "an escape from perspective," Descartes isolated inquiry from historical modes of thought and accomplished a

final shift away from a metonymic order to an order of representation based exclusively in the present.<sup>1</sup>

The *cogito* effectively replaced the historical powers of memory with the a-temporal power of intuition. Previous logical traditions from Cicero to Augustine had held that memory expressed the limitless power of the subject to construct a complex reality out of the manifold of human experience. Ramus went so far as to absorb memory into logic and identify it with method.<sup>2</sup> But Descartes regarded memory as a weak link in the cognitive chain. It presented the mind with ideas of the second order. Only intuition could provide it with first premises.<sup>3</sup> In place of metaphors which drew on a collective consciousness, Descartes installed the mathematical process of "enumeration" which divided or "resolved" all phenomena into simple parts and redistributed those parts in an abstract order appropriate to mathematical expression.<sup>4</sup>

Enumeration reproduced phenomena as series of logical propositions which, as constructions of the mind, remained accessible to it through mathematics. It encoded objects and events in the language of order and measure -- "*en tant qu'elles sont comprises par l'entendement*" -- and so brought them under the control of the understanding.<sup>5</sup> But enumeration provided no historical account of experience.<sup>6</sup> It simply rendered events comprehensible by bringing them into right relation with the methodological postulates of thought. It reduced the complex of nature to schematic

images -- "figures schématiques" -- which could be grasped intuitively and so become the object of analysis.<sup>7</sup>

This reduction of the logical process of comprehension to the mathematical process of enumeration underwrote the entire Cartesian endeavor. It placed mathematics at the theoretic core of a logic controlled by the perspective of an individual mind. Enumeration constituted a revolutionary conception of logical order whose syntax operated solely within the immediate, instantaneous world of intuition. As a quantified, serial system of representation, enumeration neutralized all ontological categories, leveled all hierarchical judgements of *genus* and *species*, and abandoned all topical notions of structure. It reduced order and measure to methodological postulates and causal relations to logical implications. In effect, enumeration sacrificed the ontological dimensions of thought to its quantitative character and established mathematics as the condition of possibility for all human knowledge.<sup>8</sup> Ultimately, the reductive analysis implicit in its processes became the controlling metaphor of the emerging physical sciences.<sup>9</sup>

The ability of Cartesian analysis to reduce natural phenomena to mathematical signs provided a powerful tool to men intent on discovering simple, unifying rules with which to control a mass of new data. By dealing reductively with phenomena, the scientific imagination could isolate specific elements and forces in nature and deal with them

analytically without reference to the carefully inducted qualities and states which had limited Baconian science. It could move beyond the referential properties of experience and deal directly and exclusively with its processes. But by exporting the necessary connections of mathematics to the realm of process in nature, Descartes inadvertently confused the order of logic with the actual unfolding of physical phenomena and arrived at the correlative conclusion that the natural order in fact conformed to the methodological postulates of thought. "Enthralled by his own metaphor," Turbayne argues, "he mistook the mask for the face, and consequently bequeathed to posterity more than a world-view. He bequeathed a world."<sup>10</sup>

Descartes' bequest consisted of a neat, systematic world governed by mechanical principles and necessary relations which answered at all points to the mathematical precision of his logic.<sup>11</sup> Such a world invited inquiry. In fact it promised to yield up its secrets to scientific investigation provided only that the scientist not violate his methodological rules. But Cartesian metaphors did substantially more than simply validate the pursuit of scientific knowledge. They actually fixed the character of science and determined its content.<sup>12</sup> Descartes explicitly required that any object, in order to fall under scientific inquiry, be susceptible of reduction by enumeration to algebraic symbols which could be grasped intuitively and manipulated through calculation. This effec-

tively excluded the investigation of anything "except that 'matter' susceptible of every sort of division, shape and motion, which geometers call quantity, and which they presuppose as the subject matter of their proofs."<sup>13</sup> Cartesian logic thus redefined reality as measurable quantity. It withdrew inquiry from the world of motive and meaning and confined it to a one-dimensional realm which systematically excluded all contextual concerns.

Medieval science, by contrast, had rested on an analogy of God with the world. Its symbolic structure had expressed a profound belief that the multi-form and vital world of nature fulfilled a purpose. Its logical metaphors had supported a conception of scientific law grounded in justice and truth. But Cartesian analysis shed all the protections of this analogy in favor of an analogy with mathematical certainty. It replaced the qualitative richness of the medieval world with the quantitative precision of a mathematically determined world -- a world confined to the present, devoid of consciousness and animated by mechanical principles. In such a scheme, the very regularity which made the world knowable made it meaningless as well. Cartesian metaphors effectively released the natural world to scientific inquiry by unravelling its mysteries through enumeration. But it failed to knit it back up again in a way which could satisfy the complex psychological needs of men. "'Tis all in peeces, all cohaerence gone," John Donne protested.<sup>14</sup> Driven by an ideal of pure



quantity, Descartes proposed a theory of inquiry which, exhausting the meaning of consciousness in its logical function, removed man as the central source of analogy in the construction of theory.<sup>13</sup>

The cogito itself expressed the supreme functional postulate. The procedural doubt which controlled its operation effectively isolated the functional aspects of thought from the thinking thing, leaving the mind to be described only in negative terms -- a kind of para-mechanical hypothesis convenient for explaining the fact of inquiry. In a sense, the *cogito* actually replaced the independent functions of the mind with the quantitative functions of mathematics. Under its impact, the mind operated constructively only in the sphere of the irrational where intuition took place. As such it retained a transcendent analogical force as the source of truth, but became totally irrelevant to the construction of rules in the practical economy of the natural world. Cartesian analysis, in fact, viewed the mind only as a limiting condition to an otherwise perfect prescription for inquiry.

The concomitant shift in metaphors seriously undercut the ability of science to construct comprehensive models relevant to the complex of human experience. Eventually, the lack of emotional satisfaction attendant on the application of reductive analysis to the natural order encouraged a search for metaphors which could reinstate issues of motive and value in the world of the emerging physical

sciences. But in the wake of Descartes' devastating critique, only the functional postulates of mathematics remained as a source of scientific analogy. Descartes' defense of enumeration had rendered quantitative relations the sole means of articulating either physical or logical order. These quantitative relations, when formulated algebraically, expressed the self-validating "laws" which governed self-regulating phenomena. Hence both the laws and the phenomena they described satisfied the methodological requirements of Descartes' science. But Cartesian analysis assumed substantially more than the quantitative integrity of its mathematical laws. It assumed the implicit quantitative structure of the reality which these laws expressed.

Edgar Zilsel points out that the concept of "physical law" in nature occurred fully developed for the first time in Descartes.<sup>16</sup> Although Francis Bacon had used the term in the *Novum Organum*, he had equated it with principles of form. "The form of heat and the law of heat are the same thing," Bacon argued.<sup>17</sup> But Descartes declared that he had discovered the actual operative "laws which God has put into Nature" and that these laws were "identical with the rules of mechanics."<sup>18</sup> Cartesian laws expressed genuine regulative postulates congruent not only to the laws of mathematics, but to the structures of reality itself.

The consequent conviction that the natural world actually conformed to the metaphors of mathematics

ultimately proved just as satisfying in its own way as the old belief that nature fulfilled a purpose. In fact, it acted as a heady tonic on scientific minds in search of a controlling vision.<sup>19</sup> Descartes' mathematically formulated "physical laws" promised not only order, but control. Whoever can construct a law can predict. And whoever can predict can preempt. Here was a metaphor to conjure with! It perfectly expressed that ideal of mastery initiated by Baconian science. Moreover, its quantitative syntax allowed for the extension of "law" by analogy across a broad spectrum of human experience.

The introduction of the metaphor of physical law into science correlated directly to the conceptual shifts implicit in Cartesian logic. The principle of enumeration inevitably encouraged a mathematical view of reality which, in turn, justified the construction of analytical laws. Moreover, these two mutually reinforcing notions coincided with and perhaps underwrote significant changes in the political, social and religious spheres.<sup>20</sup> Zilsel has argued that "the idea of a comprehensive multitude of rational physical 'laws' could not have arisen in feudalism, even if the corresponding physical facts had been known." God had served as the *principium* of the medieval world. Since He guaranteed the internal coherence of nature, there was no need to investigate its rules. But as the integrated structures of feudalism broke down, perceptions of nature ceased to enjoy their easy correspondence

with metaphysics. In defense against the more factious ideologies of the 16th Century, Zilsel claims, natural science turned to the juridical metaphor of "law" to explain the perceived regularities of the natural world. In fact, he suggests that the social connotations of the law metaphor did much to shape the developing sciences.<sup>21</sup>

If one accepts the central thesis of the present study -- that the metaphors of logic and science are mutually dependent -- Zilsel's argument can provide a convenient frame for tracing the general influences of logical theory in the 16th and 17th Centuries as well. For the crucial juncture at which the concept of physical law made its appearance in the world of science coincided precisely with that point at which Cartesian metaphors began to supplant the topical images of the Ramean tradition. An investigation of the joint careers of the legal and logical models operative in this historical context may, therefore, add an interesting dimension to the study of an era crucial to the development of American thought.

The concept of physical law entered the European consciousness as the disintegrating socio-economic structures of the High Middle Ages began to give way to developing national cultures. In fact, the rise of nation states can itself be seen as an overt political and social recognition of the regional and historical differences which became more apparent as the feudal order faded. Many forces worked to reshape the mental contours of Europe during this

period. Voyages of exploration taught new lessons in perspective and space. Colonial experiences broadened ethnological knowledge. The promise of vast riches in the new world gave impetus to an emerging money economy and encouraged the development of competitive enterprise. From the relatively closed compass of feudal Europe, emerging nations moved out into the indefinite and unfamiliar world of global politics, while religious wars at home shattered the cohesive orthodoxy of the Universal Church and replaced it with a fractious heterodox truce.<sup>22</sup>

All these trends undercut the univocal structures of feudalism and reenforced notions of difference. They undermined existing principles of order and neutralized operative conceptions of law. The disenfranchisement of the Universal Church left Europe without a Law of Nations and encouraged the development of discrete legal models. The discrediting of clerical authority placed administrative law in the hands of political partisans. Dynastic tensions and religious upheavals tended henceforth to resolve themselves according to regional and political interests which became the foundations of distinct national traditions.<sup>23</sup> Nor did national self-assertion limit itself to the political and religious spheres. The general upheavals of the 16th Century made it impossible to enforce orthodoxy in intellectual matters as well. Developing legal theories required justification through new principles of logical order which could support their distinctive

characteristics. The rise of vernaculars attendant on the breakdown of Latin Christendom coincidentally emphasized a conception of truth as a commodity which could be articulated in different ways by different groups.<sup>24</sup> Subsequent national developments in logic and science hence tended to acquire their own distinctive vocabularies.

The interactions between logic and science stand out in sharp relief against this background of emerging nation states. The ability to isolate trends in logic and science as they emerged into developing national settings affords a singular opportunity for assessing the mutual interdependence of the two disciplines. Moreover, three of these emergent national traditions assume special importance in the present context because of their relevance to American intellectual history. England, France and Germany developed radically different political and religious structures in the 16th Century. Hence their conceptions of "law" operated within fundamentally different frames. When scientists in the 17th Century reached out to these different formulations of "law" in search of a controlling metaphor, the results were correspondingly different. The divergent paths taken by science and logic in these three environments thus provides an interesting insight into the ways in which the metaphors of logic relate to the construction of legal and scientific theory.

In England, the intervention of Henry VIII effectively tied theories of law and sovereignty to questions of reli-

gious doctrine.<sup>25</sup> Drawing on an amalgam of Tyndale's doctrine of Christian obedience and Luther's theories of divine Kingship, Henry early severed England from Roman jurisdiction and established himself as the Supreme Head of the Church in England. He unilaterally replaced canon law with the Sovereign will. But by invoking divine-right theories, Henry violated ancient English Parliamentary principles grounded in the Magna Carta and disclosed the ambiguous role which positive law played in the English political process. He forced an early and definitive confrontation between developing theories of absolute sovereignty and traditional theories of common law.<sup>26</sup>

The debates precipitated by the Royal Supremacy Act prompted a general reassessment of English legal theory which resulted ultimately in a reaffirmation of the power of Parliament and the formulation of an unambiguous legislative theory which guaranteed the rights of men before the law.<sup>27</sup> This theory became a powerful tool in the hands of later reformers bent on concentrating political power in the hands of religious partisans. For, although under Henry's guidance the English Reform remained strongly Anglican, essentially aristocratic and fundamentally conservative, with the accession of Edward VI a major reorientation in English religious life began which radically changed the relationship between Parliament and the King and brought the full impact of Henry's actions to bear on English legal theory.

Edward came to the throne a pliant child of ten under the Regency of the Duke of Somerset who encouraged him in an aggressive Reform policy. During his short reign, Edward initiated many far reaching changes in English ecclesiology, all of which tended to diminish the aristocratic nature of the Anglican Church while coincidentally reenforcing lay interests. Most significantly, he offered shelter to a large group of Protestant scholars and refugees fleeing the severities of Charles V. These exiles came predominantly from areas in Germany dominated by Calvinist rather than Lutheran doctrine. Many assumed key positions in English universities, while others became outspoken political agitators.<sup>20</sup> And they all brought with them a conception of reform which, like Calvin's Visible Church, reached far beyond the confines of purely religious doctrine and entered the legal and political worlds as well. But when the religious program of Calvinism reached out into English political life, it found already established there a firm conviction of the efficacy of positive law and the inviolability of the legislative act.

Calvin's ecclesiology proved curiously amenable to English Parliamentary forms. It found a particularly strong ally in traditional English conceptions of the common law.<sup>21</sup> Calvin established the inner life as a norm for collective behavior. He insisted on each man's obligation to answer personally, not only to God, but to his fellow men. His Visible Church provided a matrix in which all



social activities converged toward man's primary function of achieving salvation and glorifying God. This external reference translated questions of private religious conscience into questions of public vocation, ultimately reducing theories of divine right to principles of original sovereignty.<sup>30</sup> Moreover, the didactic charge of Protestantism in general, and of Calvinism in particular, encouraged a further shift away from law as a metaphor of divine justice toward a new conception of law based in the "commonweal." The law in England consequently came to represent a legitimate means of securing and improving public welfare.

Under the joint impact of political and religious reform, English legal theory thus moved from an interpretation of law as a private jurisdiction toward a new conception of law as a public function which assigned men constructive social roles related to the search for individual salvation. The Visible Church extended the revolutionary implications of Luther's *Christian Liberty* to questions of public authority and political legitimacy and placed jurisdiction firmly in the hands of laymen. It reduced government to "a sort of secular intellectual corporation whose vocation was the analysis and regulation of human relations" and made public utility the basis of political power.<sup>31</sup> In the wake of Edwardean reform, the law in England became the legislative guardian of civic order, an

instrument contrived and administered by men to ensure the integrity of a godly society.

In the six short years of Edward's reign the socially potent metaphors of Calvinism permeated all levels of English life. Nor could the five years of the Marian interlude shake their influence. By 1600, with the Elizabethan Settlement and the recall of the Marian exiles from their sojourns in Geneva, Zurich and Strasburg, the image of Calvin's Visible Church had established itself at the very center of English life. It had remade theories of divine sovereignty over into an explicit theory of positive law which claimed jurisdiction based on its ability to interpret present experience and procure the "commonweal." This early identification of Calvinist ecclesiology with parliamentary forms established characteristic images in English political and intellectual life which would exert a powerful influence on the development of its logical and scientific models in the century to come. At a crucial point in the growth of a national consciousness, it supplied distinctive legislative metaphors to scientific minds reaching out for new principles of physical law and logical order. Henceforth when English scientists elaborated "laws" or appealed to "order", they would do so under the controlling influence of metaphors peculiar to their own political heritage.

In France, on the other hand, the turmoil of the 16th Century generated a radically different legal vocabulary.

The interactions of political and religious unrest in France tended, by contrast, to reenforce a native centralized absolutism. Gallicanism had traditionally expressed an authoritarian ideal. France, more than any other European power save perhaps Spain, had historically maintained an ideological conservatism in both religion and politics. Even in what Kelley has called "this age of ideological pandemonium," France remained an essentially conservative, authoritarian and Catholic power.<sup>32</sup> The *Parlement* of Francis I thus bore no resemblance to the Parliament of Henry VIII. It held no traditional legislative power but remained virtually and actually subservient to the Sovereign will. Consequently, metaphors of positive law and legislative process acquired no status in France, where all jurisdiction continued to rest firmly in the hands of the King.<sup>33</sup>

In France the Reformation identified itself with dynastic power, not positive law. From Francis I to Charles IX, French monarchs pursued religious policy wherever their political interests dictated. From the Treaty of Viterbo, to alliances with the Turks, to flirtations with German Protestants against Charles V, the Valois used religious unrest in Europe to consolidate the absolute power of their line and advance the political interests of France. With the accession of Charles IX and the regency of Catherine de Medici, religious issues became explicitly identified with dynastic politics as the Guise and Condé

factions struggled for power under their respective doctrinal flags. This identification became even more apparent in the reign of Henry III as Navarre waged dynastic warfare against the Guises under cover of religious controversy. The characteristic French subordination of religious doctrine to political expediency became official State policy in 1593 in Henry IV's famous dictum concerning the relative worth of Paris and a Mass. With the Edict of Nantes in 1598, Henry brought the religious conflict in France to an uneasy close in a political settlement which instituted no sweeping changes, acknowledged no fundamental breaks with tradition, and left French legal models much as they had been in 1515 when Francis I took the throne and Luther nailed his theses to the door.

Thanks to the political pragmatism of the French monarchy, canon law retained a qualified force in France, although patently at the pleasure of the King. The "civil law" which replaced it in certain jurisdictions reflected in fact an absolute authority resting, by divine right, in the hands of the monarch. 16th Century French legal theory thus never experienced the creative interplay between absolutist and legislative metaphors which had shaped English legal models in the wake of the Establishment. Despite the attempts of Huguenot *politiques* to formulate theories of resistance in support of their religious dissent, the concept of law in 16th Century France acquired none of the interpretive cast which it had in England

thanks to domestic political developments.<sup>34</sup> The law in France remained essentially authoritarian and absolute, propounded unilaterally and imposed from above. It found its adequate expression in Jean Bodin's *Republic* (1576) which stands as the quintessential statement of political absolutism.

The political conservatism characteristic of France in the 16th Century supplied its scientists in the 17th with a distinctive set of legal metaphors destined to control the development of logical and scientific models. As French scientists reached out in search of a metaphoric base on which to construct new principles of physical law and logical order, they encountered images and analogies which differed substantially from those which underwrote the development of English science. And their own formulations of logic and science would differ accordingly.

In England, Henry's intervention encouraged the development of legislative paradigms which in turn encouraged a positive theory of law. In France, a conservative political regime enforced the maintenance of absolutist legal models grounded in the Sovereign will. In Germany, by contrast, the extant political institutions generated a complex pattern of conflicting legal metaphors which reflected the political realities of the Empire itself. Germany in 1515 comprised a loosely knit collection of principalities, free cities and imperial territories joined together under the aegis of the politically ambiguous Holy Roman Empire.

These units lacked a clear national identity and owed allegiance to no centralized authority. This political fragmentation had a crucial impact on German legal theory and a consequent impact on the development of German logical and scientific models.<sup>35</sup>

"Europe's chief exit from the feudal age," Thomas Brady notes, "moved through the dualistic prince-estates constitution toward the absolutist monarchy of the early modern era."<sup>36</sup> In England, a centralized national government stepped into the vacuum left by disintegrating feudal forms and provided principles of order and theories of law which controlled the national life. In France, a strong dynasty gathered the loose threads of feudal power into an aggressive theory of political absolutism which compelled ideological order and guaranteed the operation of law. But in Germany, the political ambiguity of the Holy Roman Empire tended to perpetuate the hegemonic values which had characterized the old feudal order. The Hapsburg imperial structure not only permitted but encouraged the survival of small autonomous political units which a centralized national monarchy would have absorbed. As a result, the power struggles which took place in Germany during the 16th Century expressed a contest for local supremacy, not national unity. The dizzying sequence of political and religious events which comprise German history in the 16th Century clearly reflect the localization

of interest which lay at the heart of the German Imperial order.<sup>37</sup>

Through its conscious exploitation of competing local interests, German Imperial politics unwittingly provided what Brady calls a "second exit" from the feudal age which derived, not from the "prince-estates" complex operative in England and France, but rather from the "main line of late medieval social development," communalism.<sup>38</sup> By permitting the survival of locally autonomous units, the Empire ensured the growth and development of the free cities of South Germany -- urban units peculiarly well-suited to maintaining medieval functional theories of society as an alternative strategy to Imperial rule. The free-cities had been founded as special cases of feudal privilege within the Empire. Their notions of liberty thus derived from legal metaphors of exemption and immunity, not from classical notions of the *polis* like those which grounded the developing political theories of England and France. The German free cities clothed their civic ideals in Christian, not classical images. They drew on concepts of the sacral commune and the common good (*Genossenschaft*) for political justification. In short, they maintained an allegiance to those elements of structure and community which had underwritten symbolic modes of thought.<sup>39</sup>

Rich in resources and centrally located along strategic routes, these South German cities quickly became centers of trade, manufacturing and investment. As such they provided

the Imperial government with an effective foil against the political and territorial ambitions of aggressive Princes. The cities in fact played an active role in maintaining the precarious balance between Imperial, Princely and urban interests which characterized German politics throughout the 16th Century.<sup>40</sup> This balance, in its turn, prevented the ascendancy of any consistent or univocal theory of law within the Empire.

In fact, the persistence of these three competing political interests actually encouraged the development of three distinct legal models -- the *Göttliches Recht* (divine law basically congruent to canon law, imposed from above and expressing the absolute authority of the Emperor), the *Herrschaftsrecht* (seigneurial law more closely akin to hierarchic notions of fidelity and duty) and the *altes Recht* ("old law," which appealed to traditional communal rights grounded in medieval customary law).<sup>41</sup> The Imperial government, quite naturally, encouraged allegiance to the *Göttliches Recht*. The Principalities answered to the *Herrschaftsrecht*. The cities of the South recognized the jurisdiction of the *altes Recht*.

The competing sets of legal metaphors which grew out of the political realities of the Empire both dictated and reflected the unrest which plagued Germany during the 16th Century. The election of Charles V in 1519 placed unprecedented territory and power in the hands of the Emperor. Thus threatened, the Princes moved to consolidate their



position by pursuing aggressive policies against the cities. At the Imperial Diet at Worms in 1521, the Princes appealed to the *Herrschaftsrecht* in an attack against the cities' crucial right of monopoly -- a right grounded in traditional immunities guaranteed by the Crown under the *altes Recht*. This and similar threats forced the cities to defend their ancient privileges, in part by forming a strong alliance with the Crown and in part by appealing to legal principles drawn from their urban past. In 1524, however, Charles effectively neutralized this two-fold line of defense by the Edict of Burgos, which unilaterally invoked Imperial rights and authority.

But by invoking the *Göttliches Recht* against the burgeoning Reform, Charles placed the cities in a dangerous position. Internal pressures militated against their compliance with the Edict. Without abrogating the civic ideals which they sought to defend, the urban governments simply could not continue to align themselves with the Crown. On the other hand, the very *altes Recht* which they sought to protect drew its force from privileges and immunities granted by the Crown under the old order.<sup>42</sup> Denying one necessarily meant denying the other.

In 1525, under the force of political and religious events, the *Göttliches Recht*, the *Herrschaftsrecht* and the *altes Recht* came into open conflict in the Peasant's War. During the War, Brady claims, urban communalism "emerged as the rebel's leading political ideal" against the military

and political threats of the Princes.<sup>43</sup> But this unprecedented intervention of the urban commons and the *altes Recht* in the high politics of the Empire drove a decisive wedge between the cities and the Crown. Even in the interests of a precarious political balance, Charles could not ignore the threat posed by outright resistance in the cities. Ultimately the Peasant's War forced an unequivocal response. In 1530 Charles ordered a full reversion to the Catholic faith in Germany and attempted to compel unqualified allegiance to the *Göttliches Recht* which underwrote his Imperial authority.

The Edict of Augsburg marked the final dissolution of the partnership between cities and Crown. Predictably this definitive break greatly enhanced the power of the Princes. The cities scrambled to regroup. Deprived of the protections of the *altes Recht* by the invocation of Imperial authority, they cast about for a new principle of order which could validate their ancient immunities. In the end, they discovered the metaphoric justification they sought in a variation of the *lex Christiana* of the Lutheran heresy.

Urban ideologies translated Luther's "law" into a theological version of the *altes Recht*, rendering the metaphors of customary law universal by assigning them jurisdiction in a sphere of meaning which transcended all political authority.<sup>44</sup> Thus interpreted, the *lex Christiana* converged with and immeasurably strengthened the ancient desire for self-rule in the cities and supplied a

potent weapon for the defense of privileges and immunities against the power of both the Princes and the Crown. Indeed, the Reform ideologies which developed out of Luther's *lex Christiana* in the cities inadvertently mobilized a collective consciousness latent in the urban enclaves of the South. The cities already saw themselves as organic parts of a cosmopolitan order. Luther's call to freedom merely added fuel to the civic fires.<sup>45</sup> By extrapolating a new defense for an old social ethic from the priesthood of all believers, the South German cities in a sense took their case for the *altes Recht* to a "higher court," rejecting the law of both Lords and Empire in favor of spiritual as well as political autonomy.

The political and doctrinal splits which occurred within the Empire following the Augsburg decree clearly reflected the legal models operative within their respective spheres.<sup>46</sup> Those territories under direct Imperial control of course remained loyal to Rome until such time as the Emperor declared for a different source of divine truth to underwrite his political power. The principalities tended through duty and necessity to follow the religious preferences of the Princes, most of whom ultimately recognized the political expediency of Luther's two swords.<sup>47</sup> The cities of the South, on the other hand, found the theocratic visions of Zwingli and Bucer to be most compatible with their communal traditions.<sup>48</sup> Each of these three political environments, controlled by its own charac-

teristic set of legal metaphors, would provide a distinctive climate for the development of principles of order and conceptions of physical law in the 17th Century. And the political and economic influence of the South German cities, along with their characteristic commitment to education as the guarantor of civic righteousness, would ensure that the logical and scientific models developed under the influence of the *altes Recht* would come to dominate the further development of German thought.<sup>49</sup>

England, France and Germany thus each offered characteristic sets of legal metaphors to minds reaching out in search of new principles of order at the opening of the 17th Century. English civil or positive law gave priority to the individual, celebrating his self-mastery and, by extension the virtues of the society which accommodated him. French absolutist or divine-right law gave priority to the Sovereign, affirming his power over all aspects of his realm. South German customary law gave priority to the community, encouraging a structural ideal derived from medieval social theory.

But as scientists within each of these traditions reached out to their respective legal models for analogies on which to construct their physical laws, they did so under the determining guidance of three equally distinct sets of logical metaphors. As previously noted, the crucial juncture at which the conception of physical law obtruded into the world of science coincided precisely with

that point at which the analytical metaphors of Descartes began to supplant the topical images of Ramus. Moreover, as Ramean and Cartesian logic vied with each other for dominance in the Schools, they each interacted in characteristic ways with the Aristotelian tradition which persisted there. This interaction produced three distinct logical models, each curiously congruent to the national setting in which it emerged. If the underlying presuppositions of these logics can be shown to correspond in meaningful ways to the legal models described above and to the theoretical models emerging in English, French and German science, it may provide important clues to the role of legal and logical metaphors in the construction of scientific theory.

Aristotelian, Cartesian and Ramean logic each approached the worlds of thought and nature from strikingly different perspectives. Aristotelian logic proceeded under metaphors grounded in the categories which grouped concepts under ideal headings and organized thought qualitatively. It obtained its predicates through existential assertions made about the nature of things and the relationships which pertained between them. Under the postulates of Aristotelian logic, the objects of knowledge existed as derivative entities whose analytical nature depended on fixed principles of hierarchic order. Although inquiry could pursue these principles through their perceived effects and could express them through the ideal mechanism

of the categories, it could never penetrate to the true origin and nature of the order itself. Under such a model, knowledge of the natural world had to be inferred from experience and then related referentially to an assumed metaphysical order.

Cartesian logic, on the other hand, ordered all things according to the perceptions of an individual cognizing mind and expressed that order exclusively through the functional postulates of mathematics. Descartes' logic obtained its predicates through intuition and developed its arguments through enumeration. Under the operation of these metaphors, the objects of knowledge existed as rational constructs, reducible to mathematical formulae and manipulable through calculation. Inquiry could thus determine both their nature and their function by investigating the quantitative relationships which pertained between them. Enumeration, Descartes' controlling metaphor, thus embodied a changed attitude toward the nature and role of evidence in inquiry. It reduced physical objects to minimal units which one could expect to yield promptly and entirely to inquiry. Under enumeration, *scientia* thus expressed an impoverished ideal which denied the individual integrity of natural things, confined scientific inquiry to the matrix of possible experience and emasculated causal principles by reducing them to mechanical constructs.

Ramean logic, in contrast to both, proposed a genetic principle of order grounded, not in ideal categories or mathematical relations, but in a collective consciousness. Ramean logic operated not so much by addition or division as by accretion. It sought truth through the impenetration of perennial principles and obtained its predicates through a process of invention which reached back through the "places" to enduring truth-values grounded in the permanent existence of the natural world, not in its ideal forms or its present functions. Under the metaphors of Ramean logic inquiry brought the mind into contact with that store of common experience which served to structure the traditional wisdom of the race. By penetrating the structure, one penetrated the meaning. Nature itself expressed *scientia*.

Predictably, the scientific models constructed under the guidance of such radically distinct modes of analysis developed correspondingly different conceptions of physical law. The following chapters will explore the ways in which these distinct logical and legal vocabularies helped to shape the emerging scientific traditions of England, France and Germany and provided each with a set of metaphors adequate to the expression of its own peculiar theory.

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CHAPTER NOTES

1. Karsten Harries, "Descartes, Perspective and the Angelic Eye," Yale French Studies 49 (1973):34.

2. Howell points out that memory "was detached completely by Ramus from its association with [rhetoric], and was made a kind of indirect corollary of the doctrine of dialectical disposition" ("Ramus and English Rhetoric," Quarterly Journal of Speech 37 (1951):218-310).

3. It should be noted, however, that although Descartes distrusted memory in logical analysis, he reserved a role for it in epistemology, where it could serve, for example, to distinguish between states of sleep and consciousness (Adams, Oeuvres, vol. IX, 71)). In an observation of particular interest in the present context, Judovitz ties Descartes' rejection of memory to "the abrogation of mediation", although she does not tie the concept of mediation to the role of the places in the topical tradition (Subjectivity, 72). Her insight, nonetheless, penetrates to one of the fundamental differences discussed above between the means of conceptualization proper to Cartesian and Ramean logic and inadvertently ties that difference to the distinction between communal and individual forms.

4. Rules 6 and 7 of *The Regulae* present the blue print for enumeration and serial order in general (Adams, Oeuvres, vol. X, 381-392). For other specific references by Descartes to the process of enumeration see Adams, Oeuvres, vol. X, 217-219, 418, 440; also vol. VI, 112.

5. For Descartes on the laws of method with relation to the construction of deductive series see Rules 3 and 11 of *The Regulae* in Adams, Oeuvres, vol. X, 366-370, 408-410.

6. For an interesting discussion of enumeration as it relates to temporality see Judovitz, Subjectivity, 65-82. Judovitz calls intuition a "moment of pure invention" and notes that "The authority of intuition is derived from the immediacy of its character; its refusal to recognize itself as a representation of the temporal order." (Ibid., 81). L. J. Beck points out that *mathesis universalis* "exemplifies *sub specie puritatis* the activity of the mind itself" (The Method of Descartes (Oxford, 1952), 205). Peter Schouls agrees that the key to Descartes' thought is a characteristic lack of temporal dimension (The Imposition of Method (Oxford, 1980), 54-88). Albert Balz also addresses the subject of temporality in Descartes and the



Modern Mind (New Haven, 1952), 346-357.

7. Adams, Oeuvres, vol. X, 417-418; vol. ix, 123-124.

8. Judovitz points out that Descartes' "new order is independent of the objects under consideration...since it is established by convention. Rather than illustrating or mirroring nature...[the object] is subsumed under the aegis of the axiomatic system -- as a sign, a component element of the new mathematical language." Thus Judovitz argues that "the reduction of things to mathematical signs, implies not only their uniformity within its symbolic order, but also their break with the natural order" (Subjectivity, 47-48).

9. Reductive analysis is made explicit in Rule 5 of The Regulae (Adams, Oeuvres, vol. X, 379-380). "I do not accept or desire any other principle in Physics than in Geometry or abstract Mathematics," Descartes insisted, effectively reducing the manifold structures of natures to a set of quantitative relations. Adams, Oeuvres, vol. VII.1, 78-79. For an interesting discussion of some of the consequences of this conflation see Weinberg, Ockham, Descartes and Hume, 20-25.

10. Colin M. Turbayne, The Myth of Metaphor (Columbia, S. C., 1962), 69. Turbayne offers a fascinating appraisal of the effects of metaphor on the scientific mind. His discussion is particularly illuminating with reference to what he calls the "procedure-process shift" characteristic of Cartesian and Newtonian science. Turbayne describes Descartes and Newton as "cooks who first use a recipe with great skill and then add the pages of their recipe to the stew" (Ibid., 29).

11. For Descartes' vision of the constitution of the natural world see Le Monde (Adams, Oeuvres, vol. XI, 3-118).

12. For a discussion of how Descartes' method shaped his science see Schouls, The Imposition of Method, 58-63.

13. Adams, Oeuvres, vol. VIII.1, 78-9.

14. John Donne, Anatomie of the World in The Complete Poetry of John Donne, ed. J. T. Shawcross (New York, 1968), 277-278. Victor Harris expands upon this theme in All Coherence Gone (Chicago, 1949). See also M. H. Nicholson, The Breaking of the Circle (Evanston, 1950); S. L. Bethell, The Cultural Revolution of the XVIIth Century (London, 1951).

15. As Kenneth Schmitz observes, Descartes' made a metaphysical decision "to face things toward the human subject. Yet, paradoxically, that subject went out from

itself in search for an order which bore its mathematical image but excluded the recognition of its own deepest values" ("Toward a Metaphysical Restoration of Natural Things," in An Etienne Gilson Tribute (Milwaukee, 1959), 252).

16. Zilzel, "Genesis....," 245-279.

17. Bacon, *Novum Organum*, II, 17. For further references see I, 51, 75; II, 2, 4-5, 52. Zilzel goes so far as to say that Bacon's use of the term "law" is "nearer to alchemy than to modern science" ("Genesis...", 261).

18. Adam, *Oeuvres*, vol. VI, 41; vol. VI, 54.

19. As Walter Ong points out, "the arrogance of the man who tries to expound what he can glimpse of the order imposed by God on 'Nature' cannot hold a candle to the arrogance of him who thinks that there can be no order but that imposed by man" (Interfaces, 407).

20. It lies beyond the scope of this study to try to establish causal relationships between coincident historical and intellectual events. That task has been ably undertaken elsewhere (see for example Bainton, "Changing Ideas....," A. G. Dickens, The English Reformation (New York, 1964)). It will suffice for the present argument to point out certain congruences between developments peculiar to 17th Century conceptions of physical law and logical order, and to emphasize their crucial importance for the intellectual history of the United States. Some tantalizing issues will be ignored, others treated only referentially, in order to maintain a perspective sufficiently broad to reveal that "figure schématique" which is the focus of this study.

21. Zilzel, "Genesis...", 278. Zilzel gives a fascinating history of the concept of law in its theological and juridical settings from the Greeks through the Middle Ages, tying it to both philosophical conceptions of *logos* and *nomos* as well as to biblical contexts of *techne* and *physis* ("Genesis...", 247-266). See also Zilzel, "The Sociological Roots of Science," American Journal of Sociology XLVII (1941-1942):544-562.

22. For general sources on the rise of nationalist states in Europe see J. N. Figgis, The Divine Right of Kings (Cambridge, 1934) and Political Thought from Gerson to Grotius (New York, 1960); R. F. Wright, Medieval Internationalism (London, 1930). For references dealing specifically with this reorientation in relation to science see Bell, Newtonian Science, introduction; Hans Jonas, Philosophical Essays: From Ancient Creed to Technological Man (Englewood Cliffs, 1974); E. Burt, The Metaphysical Foundations of Modern Science (New York, 1925); Paul Haz-

ard, The European Mind (New Haven, 1953); Garrett Mattingly, Renaissance Diplomacy.

23. See Bainton, "Changing Ideas...", 431-433; A. G. Dickens, The Age of Humanism and Reformation: Europe in the 14th, 15th and 16th Centuries (Englewood Cliffs, New Jersey, 1972) and The Courts of Europe: Politics, Patronage and Royalty 1400-1800 (New York, 1977).

24. Kelley points out that the international and interconfessional nature of scholarship which had characterized the 14th and 15th Centuries began to break down at precisely this point. He attributes this, as cause and effect, to the displacement of "ideals" with "ideologies" precipitated, at least in part, by the Protestant dependence on indoctrination. This breakdown, Kelley points out, rendered "truth" a factional and disputative sort of commodity tied to public concerns. Truth, he says, became "multi-dimensional, myriad formed" (Ideology, 167, 207).

25. Maurice Powick points out the essential importance of the fact that the English Reformation was "an act of State" (Ozment, Reformation Europe, 271). For treatments of English ecclesiastical reform in relation to English law see G. R. Elton, England Under the Tudors (New York, 1955) and Dickens, English Reformation. Dickens deals specifically with the ways in which doctrinal change is made manifest in changing social attitudes and institutions. He claims that Henry "pushed England out of step with the Continental Reformation movements and laid a unique foundation for 17th and 18th Century intellectual developments in England" (English Reformation, 326).

26. For a discussion of the Establishment in specific relation to English legal theory see Bainton, "Changing Ideas...", 425-432. See also Paul Seaver, "The English Reformation," in Reformation Europe, 282-283; Philip Hughes, The Reformation in England (London, 1951-1954); G. R. Elton, England Under the Tudors (New York, 1953).

27. For discussions of the impact of the Establishment on English legal theory of particular relevance in this context see Martin Fleisher, Radical Reform and Political Persuasion in the Life and Writings of Sir Thomas More (Geneva, 1973); J. H. Hexter, The Vision of Politics on the Eve of the Reformation (New York, 1973); Rainer Pineas, Thomas More and Tudor Polemics (Bloomington, 1968).

28. See Dickens, English Reformation, 329-333. See also Seaver, "The English Reformation" in Reformation Europe, 282-283.

29. Ernst Troeltsch argues that Lutheranism represented an "ossified remnant of medieval ecclesiastical culture", while Calvinism and the sects which grew out of

it prepared the social and cultural background for political modernity (Ozment, Reformation Europe, 165). See also Dickens (English Reformation, 1964) who discusses the Reformation not only in its religious aspects but as a catalyst for social and attitudinal change, and Hooykaas (Religion, 1972) who discusses it in relation to the rise of scientific theory.

30. For Calvin on the Visible Church and its implications for social theory see Institutes I.5.9. For a discussion of the social implications of the Visible Church see François Wendel, Calvin: The Origin and Development of his Religious Thought (London, 1950). The Visible Church allowed for the development of a secular and legal conception of freedom, growing out of its mission to protect and promote the "Christian liberty" of its members.

31. Kelley, Ideology, 182-185; 205-206.

32. Ibid., 202.

33. For an in depth discussion of French political theory during the 17th Century see Quentin Skinner, Foundations of Modern Political Thought (Cambridge, 1978).

34. For a fascinating discussion of the innovations of Huguenot legal theorists see Kelley, Ideology, 178-211, 335-338. The essential point to remember here, however, is that the Huguenots left France. Their ultimate influence on French legal theory was therefore minimal. Their influence was felt rather in the Lowlands and the New World where they emigrated in large numbers in the 16th and 17th Centuries. See also Skinner, Foundations, 310-340.

35. For a specific discussion of the impact of German social theory and development on its intellectual milieu see Klaus Fischer, "John Locke and the German Enlightenment: An Interpretation," Journal of the History of Ideas, 36 (1975):431-446. See also Ozment, Reformation Europe.

36. Brady, Turning Swiss: Cities and Empire 1450-1550 (Cambridge, 1985), 28.

37. For general references on the political structure of the German Empire see H. A. L. Fisher, The Medieval Empire (New York, 1969); F. O. Hertz, The Development of the German Public Mind: A Social History of German Political Sentiments (London, 1957); Joachim Leuschner, Germany in the Late Middle Ages, trans. Sabine MacCormack (New York, 1980); Joseph Lortz, The Reformation in Germany, trans. Ronald Walls (London, 1968), 2 vol; Rudolf Vierhaus, Germany in the Age of Absolutism trans. J. E. Knudsen (Cambridge, 1988).

38. Brady, Swiss, 28.

39. See Brady, Swiss, 25-27. Central to both the urban and the medieval ideal was the coextensiveness of religious and civic communities. Kelley agrees that "medieval patterns seemed predominant [in the cities]. Urban freedoms, while they might be nourished by classical republicanism, had their own indigenous roots and peculiar character. The old proverb 'City air makes free' was given new life when joined to notions of Germanic and Christian liberty" (Ideology, 318-319).

40. For an in depth discussion of this balance and its implications for German history see Stephen Ozment, The Reformation in the Cities (New Haven, 1975) and Mysticism and Dissent: Religious Ideology and Social Protest in the 16th Century (New Haven, 1973). See also Berndt Moeller, The Imperial Cities and the Reformation: Three Essays (Philadelphia, 1972).

41. This distinction between German conceptions of law is drawn in Gunther Franz' history of the German Peasant's War (Hamburg, 1933) and is not to be confused with Guy Swanson's discussion of the appeal of Protestantism based on a hierarchy of "types" of political regimes (Religion and Regime: A Social Account of the Reformation (Ann Arbor, 1967)). In relation to this issue Bainton also emphasizes the importance of the delayed introduction of Roman law into Germany, a phenomena which he claims caused "an interruption in the cultural traditions of the German people such as did not occur in other lands" ("Changing Ideas...", 433). For a general reference on German legal traditions see F. Kern, Kingship and Law in the Middle Ages, trans. S. Chrimes (Oxford, 1948).

42. Ozment describes these internal pressures and their role in the institution of the Reformation in the Southern cities in Cities, 121-164. See also "Pamphlet Literature of the German Reformation" in Reformation Europe, 85-106 "The cities saw the Crown as their best chance for the establishment of law and order," Brady explains -- a need the more deeply felt as trade and commerce in South Germany expanded. This expansion, on the other hand, also served to provide the cities with a common political interest *against* the crown (Swiss, 227).

43. Brady, Swiss, 29. Brady claims in fact that the Revolution of 1525 "revived the old communal ethos and raised into prominence once more the ideas of commune and federation (Ibid., 228). Elsewhere he argues that Germany was "the one area in Europe where the looseness of the structure of power permitted the revolt within the Church to penetrate the masses and allowed pressure for change to be exerted from below. In England, by contrast, the Reformation came from above, and the broad mass of the population did not become involved before mid-century; while in France the Reformation captured neither the court nor

the masses" ("Social History..." in Reformation Europe, 163-167). Blickle also argues for the importance of the participation of the common man in the revolt (Reformation Europe, 173) while Janine Garrisson-Estebe notes that, by contrast, the peasantry in France remained essentially impervious to the Reformation (Protestants du Midi 1559-1598 (Toulouse, 1980)).

44. Moeller claims that Luther's doctrine supplied a "theological anchor" to late medieval urban ideals" (Ozment, Cities, 6, 145-147). See also Brady, Swiss, 156.

45. Moeller observes that "the Protestant movement in the cities [confronted] as nowhere else a special world...that was aware of its own value" (Imperial Cities, 69). Blickle argues that the Reformation throughout Germany tended to reenforce the latent communal structures of German society (The Revolution of 1525 (Baltimore, 1982)).

46. The extent to which the Reformation differed in regions across Germany is a hotly disputed issue. Ozment, for instance, suggests that scholars have "exaggerated the intellectual disunity of Protestantism" and argues that "evidences...of serious differences between Luther, on the one hand, and Zwingli and Bucer, on the other, is hardly overwhelming" (Cities, 8-10, 121-123, 135-146). He attributes what he sees as the superficial differences in their political stances to their different responses to concrete historical crises. Moeller, on the other hand, develops the argument that the urban character of the cities was directly responsible for both their doctrinal stance in the Reformation and the sequence of events which followed upon it (see Imperial Cities). But while Moeller argues that Luther's *lex Christiana* provided a "theological anchor" for late medieval urban ideals, Ozment points out that "his teaching about the two kingdoms rather threatened to scuttle them" by harboring a modern theory of the separation of Church and State (Cities, 7).

47. Ozment describes a reciprocal relationship between Lutheranism and the Princes. In the context of the political realities of the Empire the metaphor of the Two Swords aided the territorial consolidation of the Princes against the Crown. It allowed the Princes to turn to Roman law as an instrument for consolidating their power over the German countryside and helped them to transform feudal relationships of mutual dependence into a relationship of sovereign to subject (See Scribner, "The German Peasant's War" in Reformation Europe, 109-117 and Ozment, Cities). Berndt Moeller claims that Luther's doctrine of the two kingdoms harbored a serious "modernizing flaw" which played into the hands of the aggressive princes (see Imperial Cities). Brady agrees, claiming that, with the defeat of the peasants in 1525, Luther led the faithful back into the

arms of a feudal aristocracy, and "the Reformation became a prisoner of the princes" (see "Social History" in Reformation Europe, 173). Roland Bainton and Ernst Troeltsch both point out the affinities between the political thought of Luther and Machiavelli and emphasize its utility for the Princes (Bainton, "Changing Ideas...", 432; Troeltsch, The Social Teaching of the Christian Churches, (London, 1931), 532, 857-958)

48. The Southern cities rejected the political quietism of Luther. J. M. Kittleson goes so far as to say that "Luther's doctrine of the two kingdoms was virtually ignored by his followers [in the South]" ("The Confessional Age: The Late Reformation in Germany" in Reformation Europe, 363). Brady points out that Zwingli and Bucer both clothed their Evangelical message "in the language of civic and communal ideals, the language of the sacral corporation" (Swiss, 203). Zwingli's On Divine and Human Righteousness and Bucer's contemporaneous One Should not Live for Oneself Alone (1523) clarified the role of civic righteousness in a religion based on *sola fides* and argued for a close integration of religion and society. Luther had driven religion and society apart. But, in what Moeller calls "a correcting and deepening of Luther", Zwingli and Bucer propounded a "citified theology" whose main concern was to preserve the medieval ethical and social structure of the South. Zwingli and Bucer, Moeller claims, were "more medieval than Luther" in their support of late medieval *Genossenschaft* ideals. For a discussion of Bucer's almost Dantesque view of law and civic righteousness see Ozment, Cities, 64-66; 101-109.

49. "The South was the heartland of the Empire, Brady points out, "where its Diet always met, and where its two most powerful federations...kept the peace. It also became the heartland of all the social movements of the Reformation era." He even argues that "the political structure of the Holy Roman Empire was to a very great degree a South German one" (Swiss, 226, 10).

Chapter 3  
ARISTOTLE, RAMUS AND BACON:  
Logical Metaphors  
in  
English Scientific Models

In the context of the argument presented in Chapter II, the respective careers of Ramean and Cartesian logic take on a special significance. Although most authorities agree that Ramean logic enjoyed a preponderant influence across Europe between 1543 and 1600, modern scholars often dismiss the permanent effects of Ramism. Yet Ramean logic in fact left an indelible mark on Western thought which perpetuated its influence well beyond the 17th, and indeed, into the 19th Century. Ong documents 1100 separate printings of Ramus' works between 1550 and 1650 alone. In the context of the early days of printing this represents an enormous impact. Nonetheless, he observes, Ramism tends to disappear into the huge intellectual and historical perspectives in which it is set, exerting an anonymous and often intangible force. Indeed Ong makes the important point that Ramism becomes increasingly difficult to identify "when the very forces which it spearheaded gain momentum and finally swallow it up. By the time method and logical



analysis have established themselves firmly in the Western European psyche, the paramount role of Ramism in their establishment has been forgotten." Craig Hardin agrees, pointing out that logical analysis as we know it today *began* with Ramus. Hardin maintains that, although quickly assimilated to other systems, "the popularity of Ramus is not to be questioned."<sup>1</sup>

Bibliographic studies by Walter Ong, Perry Miller and others have made it possible to trace the relative influence of Ramean and Cartesian logic across national boundaries and so to establish patterns relevant to the present study.<sup>2</sup> Moreover a close examination of the publication patterns described by Ong reveals an interesting and potentially important fact: although Ramism exerted a strong and far-reaching influence across most of Europe, this influence developed differently in different areas, both in intensity and in focus.

Exported through the efforts of wandering humanist scholars, Ramism spread along two major routes: one up through the Low Countries, down through Scotland to England and thence to the New World; the other out through the Rhineland and into Switzerland, Prussia and Moravia.<sup>3</sup> Thus, despite its prevalence throughout Europe, Ramism developed in three distinct environments -- one centered in England, another in its native France, and a third in South Germany. In fact, the geographic patterns which emerge from Ong's Inventory prove to be curiously congruent to the

geographic spheres of the legal models discussed above. The different ways in which Ramean metaphors interacted with Aristotelian and Cartesian logic in these three settings provides an interesting perspective on the correlative development of English, French and German theoretical models.

Ramean logical theories entered England in 1574 when the Huguenot émigré Vautrollier produced two London editions of the *Dialecticae*.<sup>4</sup> The first appeared anonymously, the second under the name of Roland M'Kilwein, a Scot about whom little is known except that he matriculated in 1565 at the University of St. Andrews. But M'Kilwein's edition of the *Dialecticae* presented a rather selective version of Ramean method. Ramus had maintained the traditional distinction between what he called the "natural" and the "prudential" methods of communication, the one appropriate to learned discourse, the other appropriate to the persuasion of an unread public. M'Kilwein, on the other hand, ignored this important distinction, virtually omitting the role given by Ramus to the latter. Howell claims that M'Kilwein "converts Ramism into English with this part almost completely missing."<sup>5</sup>

By disregarding the traditional separation of learned and popular discourse, M'Kilwein refocused Ramus' theory of communication in important ways. Indeed his omission of prudential method misrepresented the balance between rhetoric and logic and distorted Ramus' original inten-

tions. By effectively subsuming the methods of logic under the art of persuasion, M'Kilwein transformed Ramus' logic into a theory of communication which reached into the practical world of the politician, the educator and the theological controversialist.<sup>6</sup> Ramus, on the other hand, had considered his dialectic to be totally uncontaminated by rhetoric. He had wanted to make communication more logical, not rhetoric more methodic. But M'Kilwein's peripheral expansion of the metaphors of method diminished the importance of purely logical forms and established English Ramism in a trajectory which carried it rapidly into a social, political and economic world well prepared to receive its message.<sup>7</sup>

Consequently British Ramism exhibited an almost exclusively rhetorical focus from the start. Ong calls it "the central route over which the Ciceronian rhetorical tradition moved in reorienting itself in the modern world."<sup>8</sup> Introduced by figures associated with the lower arts curriculum and with literature in particular, it entered the Universities under rhetorical auspices. M'Kilwein's edition of the *Dialecticae* coincided with the return of Andrew Melville from France where he had come under the direct influence of Ramus. Melville carried Ramean theories home to the University of Glasgow where he initiated a Ramist reform which, by 1578, had spread to the Universities of Aberdeen and St. Andrews. Meanwhile, a third dose of Ramism had arrived in the intellectual baggage which Sir

Phillip Sidney brought home from Frankfurt am Main where he had lodged with André Wéchel and Hubert Languet, Ramus' printer and companion respectively. Sidney directed the flood of works pouring from the Wéchel presses into England and ultimately into Ireland. In 1575, Gabriel Harvey introduced Ramist theories at Cambridge where he held the University Chair in Rhetoric. Harvey's *Ode in Memory of Peter Ramus* launched a native British Ramism which, from the first, possessed its own peculiarly rhetorical character. This selective focus became even more pronounced in 1584 when Ramus' *Dialecticae* appeared for the first time in English translation with its companion work, the *Rhetorica* of Omer Talon.<sup>9</sup>

Indeed, the explicit linking of Ramean method with the art of rhetoric articulated a bias endemic to English society as a whole, closely linked to English conceptions of law.<sup>10</sup> By the late 17th Century, England had beheaded one king, deposed another and witnessed the rise of a politically and economically powerful middle class. Moreover, the Establishment had made controversy a fact of political as well as religious life. As the role of Parliament grew, shifting political power and influence from aristocrat to commoner, it became increasingly clear that men could attain political power in direct proportion to their polemical skills.<sup>11</sup> And the Ramism peculiar to England, which confined logic as a discipline to the functions of statement and proof, provided the perfect stone

against which to whet the rhetorical tools appropriate to the controversial needs of the age.

Conceived, organized and taught less as a master guide to inquiry than as a tool for persuasion, English Ramism "perfectly fitted its times."<sup>12</sup> Its rhetorical focus played well against the conditioned belligerence of the religious and political milieu.<sup>13</sup> The English legislative system proved particularly receptive to the Ramean promise that conviction followed naturally upon the application of method. Parliamentary forms tended to give verbal strategy priority over rationality and emphasized impact rather than logical consistency. The rhetorically focused Ramism of men like Phillip Sidney and Gabriel Harvey provided a convenient theoretical justification for incorporating these dialectical skills into the economy of practical and political life. English Ramism carried the curious implication that everything one uttered in fact expressed a self-evident truth, making it the perfect tool for dogmatists. Moreover, the activism implicit in its didactic forms harbored a kind of built-in social conscience which carried over into proselytizing programs of religious reform.

Ramism had a permanent effect on the English rhetorical tradition. Championed in the lower arts curriculum by figures like Charles Butler, whose 1597 edition of Taleaus' *Rhetorica* was the first Latin edition to appear in England, it established itself as authoritative in the arts of dis-

course. In 1629 Butler produced his own version of Ramus' dialectic which transformed the Ramean doctrine of the places into a system of subject-predicate relations appropriate to rhetorical invention. Known as the *Oratoriae Libri Duo*, its title alone reveals the substantial reorientation of Ramean dialectic in England. "That he wrote on logic in 1629 and called his subject *oratoria*," Howell points out, "is a liberty that Ramus would never have allowed himself." Howell calls Butler an "adulterated Ramist" who enjoyed a broad influence in public schools and played a major role in preparing the minds which would dominate 17th Century intellectual life. As late as 1659, Butler's *Rhetorica* and his *Oratoriae* still reigned as the "supreme authority" in the academy.<sup>14</sup>

William Dugard perpetuated Butler's theories in his *Rhetorices Elementa* (1648), which presented an elementary version of Talaeus via Butler. Dugard's work had reached a fifth edition by 1657. In 1671, John Newton produced an English version of Butler, published as *An Introduction to the Art of Rhetorick*. By this time, Butler's Ramistic doctrine had "lost some of its compulsiveness," but its genealogy remained sufficiently clear to identify Newton as at least a partial Ramist. Dudley Fenner and Thomas Hobbes collaborated on a primarily Ramist rhetoric as late as 1681, and a final edition of Butler's *Rhetoricae Libri Duo* appeared in London in 1684. Howell traces its effects well

into the 19th Century, tying it to the British Elocutionary Movement and figures like Betterton, Sheridan and Mason.<sup>15</sup>

But the strongly rhetorical focus achieved by English Ramists tended to obscure the purely logical aspects of dialectic. Thus, although in rhetoric the introduction of Ramean theories resulted in what Howell calls "a complete victory for the French invader," in the upper reaches of the curriculum -- that is in logic proper -- the effects of Ramism proved substantially less pronounced. In fact, the Ramist "logics" which appeared in England between 1587 and the late 17th Century all carried the same rhetorical twist which Sidney and Harvey had given the doctrine. William Perkin's *The Arte of Prophecyng* (1606) typically focussed on the arts of communication and preaching. George Downham's *Commentaries on the Dialectic of P. Ramus...* (1610) continued this bias, as did Alexander Richardson's *The Logician's Schoolmaster* (1624), which had a tremendous impact on early American thought. William Ames' *Demonstratio Logicae Verae* and *These Logicae* (1646) both clearly bore the stamp of Harvey's refocused Ramism, as can perhaps best be seen by the influence they had on Ames' student William Chappell, who produced a dialectical treatise with the curious title of *Methodus Concionandi* (1648) which appeared in English translation as *The Preacher* (1656). It was Chappell's *Preacher* which shaped the Ramism of John Milton, whose Latin text of Ramus' *Dialecticae* appeared in 1672.<sup>16</sup>

Although controversy between Ramists and Aristotelians raged at Cambridge and Oxford, particularly in the 1580's and 1590's, Ramist logic itself never gained a significant foothold in the English Schools.<sup>17</sup> English logic in fact remained strongly and somewhat naïvely Aristotelean in character, following rather the "logics that were written in England to restore scholasticism while preserving some of Ramus' innovations," among them Thomas Blunderville's *Art of Logike* (1599), John Sanderson's *Institutionum Dialecticarum Libri Quatuor* (1589), Samuel Smith's *Aditus ad Logicam* (1613) and Edward Brerewood's *Elementa Logicae* (1614).<sup>18</sup> These logics, which explicitly revived the predication theory abandoned by Ramus in favor of the places of invention, "taught logic to all England during the 17th Century." Indeed the two most widely read, Robert Sanderson's *Logicae Artis Compendium* (1618) and Richard Crakanthorpe's *Logicae Libri Quinque* (1641), played a great part in the education of Isaac Newton at Cambridge between 1661 and 1665, as well as that of Jeremy Bentham at Oxford nearly a hundred years later.<sup>19</sup> Perpetuated in works like Henry Aldrich's *Artis Logicae Compendium* (1691), this Neo-Aristotelianism maintained the outlines of Aristotle's logical doctrine in England well into the 19th Century, in fact "for the entire period between Bacon's *Novum Organum* and John Stuart Mill's *A System of Logic*."<sup>20</sup>

The early adulteration of Ramean logic by a disproportionate emphasis on its rhetorical components, and



the concomitant revival of Aristotelian doctrine, diminished the effects which Ramean method had on the development of English scientific models. When English scientists sought a method, they followed Sanderson, not Ramus. "Few remembered," Ong laments, "that the cult of method, which now meant almost exclusively the cult of routine, had once meant not that but the cult of clarity. Men no longer felt the quest for method as the quest for logical lucidity which had stirred the soul of Descartes."<sup>21</sup> This in turn tended to minimize the effects which the logical theories of Bacon and Descartes had on English science as well. Indeed no logic based directly on Bacon's *Novum Organum* appeared in England before 1700. And, although a derivative Cartesian logic appeared in the *Logique de Port-Royale* after 1664, this also proved incapable of dislodging the strong Neo-Aristotelian tradition which dominated the English universities well into the next century.<sup>22</sup>

In fact, Howell concludes, "it looked as if English logicians had permanently turned their backs upon the possibility of reforming logical theory in the direction of the revolutionary teachings of Bacon and Descartes."<sup>23</sup> Aldrich saw no future for logic in the experimental sciences as outlined by Bacon and Descartes. Indeed he accused Descartes of simply replacing logic with mathematics and Bacon of replacing it with experiments. Likewise, John Sergeant (*The Method to Science*, 1696), dis-

missed Descartes as excessively speculative and Bacon as insufficiently so. He attacked Descartes specifically on the grounds that the *cogito* expressed an a-logical principle incapable of acting as the foundation of true scientific knowledge. Baconian induction he rejected as incapable of producing demonstrative certainty.<sup>24</sup>

In the meantime, however, the emerging physical sciences continued to extend the limits of the field of inquiry. Baconian methods effected a revolution in scientific practice, if not in theory. And Descartes' advocacy of mathematics found a ready audience among experimentalists. Consequently, the models of English science drew farther and farther from the metaphors which controlled the logic in which its practitioners were trained.<sup>25</sup> In reaction, English scientists sought their own forum in the Royal Society which, under the motto *Nullius in Verba*, renounced the logic of the Schools and asserted the right of the physical sciences to explore and define truth according to their own lights.

Significantly, however, the scientists of the Royal Society *did not* turn to Ramus, Bacon or Descartes for illumination. In fact, a strong Neo-Aristotelian lobby kept all three from having a determinate impact on the development of English science. When the pioneers of the Royal Society sought logical metaphors, they turned instead to one of their own -- John Wallis, whose *Institutio Logicae* (1687) ironically perpetuated many of the main features of

the very Neo-Aristotelian tradition which the Society sought to escape. Wallis systematically dismissed Ramus' reliance on hypotheticals, ignored Bacon's doctrine of induction and denied Descartes' mathematical insights. Yet this was the logic which shaped the theoretic core of English science and bequeathed to the 18th Century the metaphors which would control its models.

Wallis represented the conservative wing of the Royal Society. Indeed other, less influential, efforts within the Society attempted to produce a logical theory more in keeping with scientific advance, but these proved largely unsuccessful. Represented principally by the works of John Wilkins, Robert Sprat and Joseph Glanville, these efforts focused, characteristically, on the rhetorical aspects of logical presentation and sought a dialectical theory which would provide for the transfer of experimental knowledge from scientist to scientist. Sprat's *History of the Royal Society of London* (1667) proposed an impartial vocabulary which would subordinate argumentation to exposition and make persuasiveness a natural consequence of accuracy. John Wilkins attempted to provide this vocabulary in a cumbersome work called *An Essay Towards a Real Character, And a Philosophical Language* (1668), which presented a philosophical grammar specifically designed to enumerate and describe all things. Appended to the 454 pages of the main text, Wilkins set out an *Alphabetical Dictionary, Wherein All English Words According to Their Various Sig-*

nifications, are either referred to their Places in the *Philosophical Tables, Or Explained by such Words as are in those Tables*. Wilkin's work stands as a clear example of the Ramean rhetorical influence run amuck. Although his passion for a new scientific medium of communication had little effect on the course of English science, it did encourage the development of the *plain style* which Ong claims became the literary arm of the new science.<sup>26</sup>

Wallis' *Institutio Logicae*, on the other hand, presented an explicitly, if somewhat modified, Aristotelian logic. It reaffirmed singular propositions as a distinct class of universals and insisted that hypothetical statements and other composite arguments be brought under the rules governing categorical syllogisms. Most significantly, it denied that induction represented an independent form of argumentation. Wallis did not associate induction with observation, experiment or first-order discovery as Bacon had. Induction, he claimed, expressed rather a variant form of the syllogism incapable, except in instances of complete enumeration, of producing certainty.<sup>27</sup> Wallis' textbook went through four 18th Century editions, influenced Dugald Stewart as late as 1809 and was mentioned with approval by Richard Whately in his *Elements of Logic* in 1826. L. T. More claims that his work in mathematics "became the standard work on the subject and is constantly referred to by Fermat, Barrow [and] Newton."<sup>28</sup>

The Neo-Aristotelian metaphors which controlled Wallis' logic emerged clearly in the theoretic constructs developed by the scientists of the Royal Society. Men like Gilbert, Halley and Newton operated under an elemental faith that the fundamental regularities of nature could be expressed in universal laws which ranged phenomena under ideal mechanisms. But here was a scientific vision fundamentally different from that of Baconian logic which had insisted on initiating scientific reasoning through induction. Nor did it reflect Cartesian logic, which rejected the categories as tools of inquiry and relied rather on intuition for its self-sufficient propositions. Indeed the vision which drove the men of the Royal Society to construct their mathematical models derived rather from logical metaphors which represented particular propositions as reflections of a categorical order. It derived, in short, from the Neo-Aristotelianism of men like Sanderson and Wallis.

Newton's methodology clearly illustrates the influence which Neo-Aristotelian metaphors had on the scientific models developed under their guidance. Under the principles of the logic in which he was schooled, Newton could not represent the process of induction as apodictic except in instances of complete enumeration. Nor could he employ hypothesis as an investigatory tool. Sanderson had said so and Wallis had concurred. And yet the developing physical sciences increasingly demanded the formulation of comprehensive laws. In response, Newton proposed a logical

subterfuge. In order for laws to be universally applicable, he argued, they must first be logically "inferred from the phenomena", not induced from experiment or deduced from hypotheses. Only then could they be "rendered general by induction".<sup>29</sup> Newton's reliance on inference in the construction of first premises gave his axioms a rational base compatible with Neo-Aristotelian predication theory. And his reliance on induction in the verification of rules brought his laws into conformity with the demands of the new science.

Newtonian "inference" operated through metaphors closely akin to those of mathematics. Note for example the way in which Newton arrived at his law of centripetal force. He simply stated that if a body moves around a stationary point in such a way that radii drawn between the body and the point mark out periodic areas, then the body must be impelled "by a centripetal force directed to that point."<sup>30</sup> But as Gerd Buchdahl points out, "to get from the kinematical antecedent to the dynamical consequent, the proof, apart from geometry, employs the first law of motion, according to which since the body is not moving in a straight line, it must be subject to 'the action of some force that impels it'. It also uses the second law [again, Newton's own], from which it follows that the acceleration of the body takes place in the direction of the straight line in which the force is impressed."<sup>31</sup> In other words, Newton simply deduced the law of centripetal force from

unilaterally formulated "laws of motion" and several Euclidean proposition. His inferred "law" thus expressed a purely logical construct deduced from mathematical theorems assumed from the start to reflect the phenomena -- a far cry from Baconian induction!

Indeed the extension of Newtonian rules from particular events to universal phenomena took place entirely under the auspices of Newton's own third "Rule of Reasoning" which authorized the investigator to rely on "the analogy of Nature" in the construction of laws. "The qualities of bodies...which are found to belong to all bodies within the reach of our experiments, are to be esteemed the universal qualities of all bodies whatsoever," Newton's rule bluntly stated. "And this [process of inference] is the foundation of all philosophy."<sup>32</sup>

With this sweeping definition of inference, Newton justified his science according to the metaphors of his logic, thereby avoiding any overt reliance on hypotheticals. Wallis had dismissed hypotheses as inferior syllogistic forms. Ramus, on the other hand, had endorsed their use. Newton, for his part, was content to smuggle hypotheses into his arguments disguised as "rules" inferred from phenomena. His dictum of *hypotheses non fingo* makes sense, in fact, only in the light of his negative definition of hypothesis as simply "Whatever is not deducible from phenomena" -- a definition which rested squarely, if somewhat ironically, on his sweeping definition of

inference as virtually anything which *is* deduced from phenomena.<sup>33</sup> But by grounding his logic in inference, Newton did substantially more than simply maintain the metaphoric base of his logic. He also fixed the character of his science.

Inference supplied Newton with a logically articulated metaphor for representing the formal operations of the natural world. Around this metaphor he built a set of underlying images and conceptual analogies which supported his mathematical physics. Inference allowed Newton to explain the complexities of experience using such abstract concepts as universal attraction and the void while still arguing for an inductive science. It justified the inclusion of non-empirical entities such as idealized material particles in the construction of "objective" scientific laws. Although these inferred forces and particles were at base just as imaginary as the substantial forms and qualities which they purported to replace, Newton could treat them, according to his Rules, as first principles in chains of deductive reasoning which aimed at laying bare the underlying "realities" of nature.<sup>34</sup>

Ultimately this method made Newton's inferred laws appear more real than the observed phenomena they purported to explain. Donald Ault comments on how the metaphors controlling Newtonian science had the tendency "to isolate those features which do not change and reify them as the features of the world which are "real" while the shifting



features of time are taken to be 'appearance'."<sup>35</sup> Newton's laws thus became Eternal Forms which expressed a methodological correlate of the categories. By subsuming these powerful metaphors of organization within a logically consistent theoretical structure, Newton gave his scientific laws the ability to extend themselves analogically across virtually all disciplines -- a characteristic which accounts for his profound influence on 18th Century thought.<sup>36</sup>

Newtonian science thus operated through continuous laws inferred from experience -- laws not unlike the positive laws established by English Parliamentary forms. Paul Feyerabend points out that Newtonian laws in fact bore a close resemblance to the Protestant Rule of Faith which governed private and political life in England. Both enthroned experience as a new authority within a deductive framework which remained "logically vacuous." Experience for the Puritans and for Newton operated within a community already committed to certain ideas and faced with a psychological need to support the process of indoctrination on a logical base. "In the case of Protestantism this base supported a faith. In the case of Newton, it supported a scientific theory. In both cases," Feyerabend claims, "we are dealing with nothing but a party line." Feyerabend's rhetoric is perhaps a bit strong, ignoring the genuine abstractive qualities of Newton's mathematical language.

But the similarity between the supporting metaphors proves striking in the present context.<sup>37</sup>

Indeed Newton's portrayal of law as logical inference rested on a central paradox born of his attempt to accommodate the methods of an inductive science to the metaphors of a Neo-Aristotelian logic. And in fact the logical ambiguity of Newton's claim to derive universally valid inferences from particular events ended by creating what Gerd Buchdahl has called a "crisis of intelligibility" within his physics.<sup>38</sup> This crisis manifested itself in Newton's inability to forge an existential link between his inductive data and his theoretical laws. It raised important questions as to the logical status and *modus operandi* of these laws. What actual physical properties corresponded to the mathematical functions expressed by the law of gravitation? Through what physical medium did these laws operate? Newton claimed "only to give a mathematical notion of those forces, without considering their physical causes and seats."<sup>39</sup> But clearly the analogical ground of his Rules of Reasoning expressed a commitment to provide an actual physical account of universal laws.

Faced with this crisis of intelligibility, the scientists of the Royal Society reached out for logical metaphors which could more adequately express the relationship which pertained between Newton's data and his laws. They needed a logic which could articulate the methodological structure of scientific hypotheses -- one which

could arrive at valid laws without reference to the idealizing tendencies of Newton's Rules. John Locke addressed this need in his *Essay Concerning the Human Understanding* and later in his more explicitly logical treatise, *Of the Conduct of the Understanding*, which provided a new set of metaphors which could validate the use of inference in the construction of laws.

Like Newton, Locke accepted experience as the "new authority" in inquiry.<sup>40</sup> But Newton had arrived at a methodological impasse by trying to adapt his scientific model to the demands of his logical metaphors. The originality of Locke's approach lay in his revolutionary commitment to adapt his logical metaphors to the demands of his science. Thus he rejected Newton's tendency to portray experience as phenomena and laws as logical consistency. Experience, Locke claimed, "extends as far as the *present* testimony of our senses, employed about particular objects, that do *then* affect them, and no further."<sup>41</sup> Since there existed nothing in experience so necessary as a logical law, the whole "scientific" enterprise of constructing models that conformed to logical metaphors became meaningless.

Newton had identified particular experimental results with phenomena in general. This had allowed him to ascribe an actual logical status to phenomena. Note, for instance, the way Newton represented Kepler's laws in the *Principia*. For Kepler, these laws had expressed the theoretical conclusions of an elaborate analysis of observational data.

But for Newton, they formed part of a logical argument which led back and forth between selected and carefully controlled experiments and the articulation of a universal theory. The *logical status* with which Newton endowed experience gave his laws their prescriptive power. But this same self-reinforcing definition of experience also led to what D. M. Clarke has called the "theory-ladenness" of Newtonian science -- that is, its characteristic need to create ideally isolated systems, to eliminate the irrelevant from the observational field -- in short, to control the experiment.<sup>43</sup>

Locke, on the other hand, replaced Newton's categorical ideal of consistency with a new scientific ideal of accuracy. He set out to provide an "historical, plain method" for exploring nature which operated solely on the data of experience.<sup>44</sup> Consequently, he ignored the ontological status of the products of inference which had so confounded Newton and focused rather on the process of inference itself as it related to inquiry. While he admitted the functional role which inductive inference could play in guiding the conduct of science, he denied the ability of purely logical inference to underwrite *scientia* in the older Aristotelian sense.<sup>45</sup> For Locke, inference consisted, not of rules which governed the operation of reason, but rather in the process which the human reason followed in forming its ideas. "The Understanding is not taught to reason by...Rules," Locke claimed, "It has a

native Faculty to perceive the Coherence, or Incoherence of its *Ideas*."<sup>45</sup> Scientific laws embodied no "reality" discovered through the application of reason. They described tentative mental constructs legislated through the application of method. They portrayed the way nature behaved as a matter of fact, not as a matter of necessity.

"To infer," Locke declared, "is nothing but by virtue of one Proposition laid down as true, to draw in another as true, i.e. to see or suppose such a connection of the two *Ideas*." Inference thus represented an instantaneous natural action of the rational faculty in its proper functions of sensation and reflection. What had been deemed by the Neo-Aristotelians an imperfect form of reasoning became for Locke a perfect form of inquiry, since what "shews the force of the Inference, and consequently the reasonableness of it" is not its conformability to a categorical order, but rather "a view of the connection of all the intermediate *Ideas*, that draw in the Conclusion, or Proposition inferr'd." Since the mind itself was "able to judge of the Inference," inquiry could proceed "without any need of a Syllogism at all." In fact, Locke concluded, all knowledge consisted in inference, being "nothing but the perception of the connexion and agreement, or disagreement and repugnancy of any of our *Ideas*."<sup>46</sup>

Locke's redefinition of inference as a cognitive process made the logical crisis implicit in Newton's methodology painfully apparent. Newton's inferred laws had

derived their power from their ability to be theoretically predicable throughout the universe. Newton's Rules had in fact made his mathematical forms isomorphic, if not identical, with the actual coherence of the world. But Locke portrayed inference as cognition, pointing out the total inadequacy of Aristotelian categories to contain the scientific spirit. As a corollary to his phenomenalist theory of inference, Locke maintained that all abstractions shared an intrinsic inability to represent physical reality. Under his critique, mathematical laws and logical categories alike became mere "inventions and creatures of the understanding" which remained ontologically distinct from physical reality. They could not express any actual coherence or objective truth. In fact, they presented only an incomplete description of accidental connections perceived between analogous phenomena. Since physical science could investigate only these accidental connections, and since "there is no discoverable connection between any secondary quality and those primary qualities it depends on," Locke concluded that science must abandon its theoretic pretensions altogether and content itself with simple experimental statements grounded exclusively in present experience.<sup>47</sup>

It is important in the present context not to exaggerate the influence which Locke ultimately had on the construction of 18th Century scientific models. Although Locke's *Essay* underwent 20 editions between 1706 and 1805

and offered an increasingly effective foil to the Aristotelianism of Aldrich and his school, his logic never achieved total dominance in England. The ambivalence of Locke's position in the English logical heritage is made evident by the persistence of Neo-Aristotelianism even in the face of his revolutionary epistemology. "It must always be remembered," Howell points out, "that Locke's *Essay* was getting its first readers at the very moment in history when Henry Aldrich in his Aristotelian treatise, *Artis Logicae Compendium*, was denying to Bacon and Descartes the right to be considered as true logicians, and that under Aldrich's guidance the old logic seemed to have withstood successfully the assaults of its two most formidable early seventeenth Century adversaries, and to be no longer in danger from them for the indefinite future."<sup>48</sup> In fact, English logic did not come to terms with induction until after the development of its most influential scientific models, most of which were developed under the influence of the Neo-Aristotelianism described above.

On the other hand, Locke's juxtaposition of a cognitive theory of inference with a mathematical physics placed the metaphors of English logic on an inevitable collision course with the ideals of its science. By making the conditions of the mind's own functioning the metaphoric ground of inquiry, Locke made the frontiers of science coextensive with the limits of human experience. But here was a scientific ideal vastly different from the mathematical

vision of Newtonian physics! Locke's logic of inference thus presented the English scientist with a fundamental dilemma. Methodologically confined to the investigation of present effects, yet metaphorically committed to the expression of theoretical laws, he would henceforth have to justify his theoretical aspirations in the light of his methodological postulates.<sup>49</sup>

Much of the subsequent history of English science can in fact be written as the history of various attempts to resolve this dilemma. Berkeley pursued an explicit critique of the limits and validity of mathematical models, claiming that mathematics, as subordinate to experience, had no role in the construction of theory. His attack against the value of numbers as a source of abstract concepts appears most clearly in his attempt to develop an adequate theory of the processes of vision and perception -- a theoretical problem paradigmatic of the general philosophical difficulties arising from the introduction of sensationalist theories of knowledge into a scientific world conditioned by a mathematical physics. Newton had discussed perception in mathematical terms, presenting a theory of vision which operated through geometric metaphors. But Locke had converted consciousness itself into an optical analogy with his image of the *camera obscura*.<sup>50</sup> Berkeley, in turn, carried Locke's optical metaphor over into metaphysics and arrived at a whole new interpretation of what it meant to be "real" -- *esse is percipi*.<sup>51</sup>



Likewise Hume, convinced of the critical inadequacy of Newton's methodology, took both Locke and Berkeley at their word and proceeded to show what the ultimate consequences of a phenomenalistic theory of inference would be. He dismissed both logical and psychological inference as a means for arriving at existentially valid statements, thereby reducing science to a purely experimental discipline devoid of any ability to make existential statements beyond the limits of concrete sensible effects. Methodologically committed to provide experimental descriptions of a purely functional nature by his reductive analysis of cognition, Hume arrived ultimately at a description of knowledge in which all noetic structures proved derivative and therefore subordinate to pure sensation. On this foundation he proceeded to build a psychological theory of knowledge founded on prelogical beliefs which would eventually destroy the logical basis of all theoretical science.<sup>52</sup>

18th Century British scientific models thus developed out of attempts to bring Locke's redefinition of inference to bear on the powerful metaphors which controlled Newtonian physics. Indeed only with the radical dissociation of these metaphors from scientific inquiry accomplished by John Stuart Mill in the next century could English science be said to have come to terms with its own logic. Mill gave Lockean metaphors of mental mechanism their fullest possible expression. For Mill, ideas became mere points of consciousness -- Newtonian particles made mental -- and

their construction took on a palpably mechanical quality absent from Locke and even Hume. Locke had preserved resemblance as a mental analogue of Newtonian "attraction". But Mill, recognizing the deeper philosophical motives lurking under the surface of Newton's Rules, explicitly denied inference, resemblance or relation as operative principles in concept formation. He simply denied the analogical role of logic in the structuring of scientific hypotheses. Contiguity alone accounted for the construction of concepts, he claimed. With Mill's *System of Logic* in 1843 English science finally acquired a fully articulated logic of induction after the model of Bacon. Mill's *System* made induction "the main question of the science of logic" and put the Neo-Aristotelian tradition of Wallis and Aldrich "into permanent eclipse."<sup>53</sup>

Hence the career of Ramism and its interaction with Aristotelian paradigms in the English intellectual milieu did indeed have an impact on the development of English scientific models. The naïve Aristotelianism which persisted in the English Schools arose in reaction to the disproportionately rhetorical focus which English Ramists gave to the art of dialectic. Howell in fact argues that "the two systems are so intertwined that the problems of the one are in fact variations upon the problems of the other, and a firm grasp of the history of both is essential to the understanding of the fate of either one."<sup>54</sup> As a consequence of this characteristic development, the logical

doctrine which shaped the minds of English scientists in the 17th and well into the 18th Centuries continued to draw on metaphors grounded in Aristotelian logic -- metaphors which perpetuated the paradox of basing a universal science on the assertoric predicates of categorical logic. These metaphors dictated Newton's Rules and shaped his comprehensive laws. Ultimately they encouraged the construction of a scientific model which ended by denying its own ability to legislate in the natural world.

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CHAPTER NOTES

1. Ong, Ramus, 171; Hardin, Glass, 149. A. J. Smith suggests that some of these claims have been exaggerated, but uses primarily arguments drawn from the field of rhetoric to support his claim ("An Examination of Some Claims for Ramism," Review of English Studies, VII (1956):349-359).

2. Walter Ong. Ramus, Method and the Decay of Dialogue (Cambridge, 1958) and Ramus and Talon Inventory (Cambridge, 1958); Perry Miller. The New England Mind: The 17th Century (New York, 1939); Craig Hardin. The Enchanted Glass (New York, 1936); Samuel Morison, The Founding of Harvard College (Cambridge, 1935) and Three Centuries at Harvard (Cambridge 1936); Wilbur S. Howell. Logic and Rhetoric in England: 1500-1700 (Princeton, 1956) and Eighteenth Century British Logic and Rhetoric (Princeton, 1971).

3. These patterns are established in Chapter VIII of Ramus where Ong details the appearance of overt and implicit Ramean influences in the major universities, and in the Inventory, where he enumerates the extant editions of Ramus' *Dialectic* and *Rhetoric*. Miller's work on the influence of Ramean thought on American intellectual history draws similar conclusions (Miller, N.E. Mind, 493-501).

4. Ong, Ramus, 301-303. Howell agrees that "these two works may be taken to mark the official beginning of Ramus' vogue in England" (Howell, "Ramus and English Rhetoric:1574-1681," Quarterly Journal of Speech 37 (1951):303.

5. Howell, Logic, 186, 160-165. See also Howell, Poetics, Rhetoric and Logic (Ithaca, 1975), 143-144.

6. Howell claims that this tendency is further reenforced by M'Kilwein's substitution of biblical for classical allusions and illustrations (Logic, 183, 187). Smith draws a similar conclusion ("Some Claims...", 354).

7. Ong points out, however, that Ramism contained the seeds of just such a misrepresentation. "It is a historic fact," he notes, "that Ramist method had its source in rhetoric" (Ong, Rhetoric, Romance and Technology (Ithaca, 1971), 177).

8. Ong, Ramus, 303. Howell suggests that English Ramism's rhetorical tendencies were reenforced by the fact

that the editions of the *Dialectic* from which English Ramism was drawn were based on the 1556 Paris edition of the *Dialecticae Libri Duo*, a latin version which was in fact "a severely reduced and schematic formulation of Ramus' earlier writings on dialectic" ("Ramus...", 301-302). Most recent scholarship has in fact concentrated exclusively on the rhetorical aspects of Ramism. Craig Hardin, for instance, argues that "the method of Ramus was ...intentionally directed toward literature" (Glass, 150), while Rosemund Tuve concentrates solely on the formative effects of Ramism on Elizabethan literary imagery in her study Elizabethan and Metaphysical Imagery (Chicago, 1947). Smith betrays a similar lop-sided focus, but admits that "Ramus and the Ramists were not arguing or intending to argue that poetry and dialectic are the same, and their ends the same; indeed, to have maintained such a position would have been a denial of their fundamental tenets" ("Some Claims...", 358).

9. See Ong, Ramus, 298-310; Howell, Logic, 178-189, 254-268. Howell points out, moreover, that Harvey's first exposure to Ramism came through the *Ciceronianus* and not through the *Dialecticae*, a fact which colored his Ramism. For Sidney's Ramism see Tuve, Elizabethan, 29-42 and Smith, "Some Claims...", 352-355.

10. Ong argues that Ramism presented a view of the intellectual world congenial to the rising merchant and artisan classes (Rhetoric, Romance and Technology (Ithaca, 1974), 173). Hooykaas supports Ong's observations in Religion and the Rise of Modern Science (Edinburgh, 1972), 98-103.

11. Howell suggests that the decline in the power of the aristocracy had a profound effect on the development of English rhetoric (Logic, 383-385). Ong agrees, noting that the "movement from an authoritarian to an objectivist state of mind" supported the increased importance of rhetoric in the English intellectual milieu (The Presence of the Word (New Haven, 1967), 283). Bell ties this trend specifically to the development of science in England, arguing that "it seems to be no accident that in England the mid-17th Century saw the rise of both science and of parliamentary power" (Newtonian Science (London: 1961), 12). See also Hooykaas, Religion, 111.

12. Howell, 18th Century, 16.

13. Kelley, in fact, claims that Ramism, in its rhetorical guise, "amounted to no less than a theory of propaganda" (Ideology, 135). Ong agrees, pointing out how Ramist rhetoric had the tendency to produce "individuals predisposed to approach any subject by taking a side" (Romance, 65).

14. Howell, Logic, 268-269; "Ramus...", 307-308.
15. Howell, 18th Century, 142-242.
16. Howell, "Ramus...", 304. For a more detailed discussion of these Ramist logics, see Howell, Logic, 173-246.
17. Ong, Romance, 86. Ong claims elsewhere that "there is practically no serious and mature scholarship oriented by Ramism in the British Isles. ...[It] plays out in a spate of...textbooks in rhetoric and in rhetorically oriented logic" (See Ramus, 303). The publication patterns outlined in the Inventory bear these conclusions out. Ong admits, however, that "this does not make the Ramist influence in England any the less telling. Quite the contrary. ...It shows that rhetoric and, more significantly, logic were being assimilated independently of a well-worked out philosophical foundation" (Ramus, 303).
18. Howell, Logic, 285.
19. Ibid., 285, 306-307.
20. Howell, 18th Century, 14-15. Howell agrees with Ong that Ramean logic, as opposed to Ramean rhetoric, did not reflect the main line of development of dialectical theory in England during the 16th and 17th Centuries. Howell emphasizes the persistence of Aristotelian logical doctrines in England, claiming that "Aldrich's attitude was by no means an outmoded opinion when he expressed it. It did not represent the temporary reversal of a trend towards the acceptance of Bacon's work by British followers of Aristotle" (18th Century, 51). John Wesley, the founder of Methodism, produced a translation of Aldrich's *Compendium* in 1750 which consequently went through several editions. In 1817, the work reappeared at Oxford as the *Artis Logicae Rudimenta* which went through five editions before 1867. For an in depth discussion of the Aristotelian logical tradition in England see Howell, Logic, 282-342.
21. Walter Ong, "Peter Ramus and the Naming of Methodism," Journal of the History of Ideas 14 (1953):245.
22. Howell, Logic, 365.
23. Howell, 18th Century, 13.
24. For a detailed discussion of Sergeant's Aristotelianism, see Howell, 18th Century, 61-71.
25. Paul Feyerabend describes the situation as a "fascinating, tortuous, schizophrenic combination of a conservative ideology and a progressive practice" (The Methodological Heritage of Newton ed. Butts and Davis (Toronto, 1970), 151).

26. The plain style vaunted orderly sequence over every other aspect of communication. Walter Ong sees the development of plain style as the verbal counterpart of the "visualist universe of objects" implicit in Ramist dialectic (Ramus, 213). It is under the guise of the Puritan plain style that English Ramism is most strongly felt in early American thought. For a discussion of Puritan plain style and its eventual effects on early American thought see Ong, Ramus, 283-292; Miller, Mind, 111-154; Morison, Three Centuries, 23-53. For a discussion of the effects of plain style on contemporary literature, see Tuve, Elizabethan, 340. For a discussion of the devastating effects of the plain style on the later development of English rhetoric see Howell's discussion of the English Elocutionary Movement, 18th Century, 145-256.

27. John Wallis, Institutio Logicae (Oxford, 1687), 167-168.

28. Howell, 18th Century, 29; L. T. More, Isaac Newton, A Biography (New York, 1934), 36.

29. Isaacs Newton, Principia Mathematica, trans. A. Motte (Berkeley, 1960), 547.

30. Newton, Principia, 42.

31. Gerd Buchdahl, "Gravity and Intelligibility," in Butts and Davis, Heritage, 75.

32. Newton, Principia, 398-399.

33. Ibid., 547. Newton's rejection of hypothesis was in fact a half-hearted one. Turbayne points out that in the first edition of the Principles, Newton presented nine Hypotheses around which he structured the entire Third Book. But in his second edition (1713), he overcame the awkwardness of this terminology by simply transforming all nine Hypotheses into "Rules" upon which he could then base his argument. "This," Turbayne argues, "is surely a case of *hypotheses fingere*," albeit unacknowledged (The Myth of Metaphor (Columbia, S. C., 1962), 44).

34. Marie Boas and Rupert Hall point out that Newtonian corpuscles could only be *illustrated*, not proved, by experiment ("Newton's Mechanical Principles," Journal of the History of Ideas, XX (1959):168).

35. Donald Ault, Visionary Physics: Blake's Response to Newton (Chicago, 1974), 170. Ault presents a fascinating discussion of Newtonian science, arguing that his system in fact amounted to nothing less than the actual disguising of metaphor as logic. This he feels is what Blake was reacting to in his protracted campaign against Newtonian physics. Blake, Ault suggests, perceived that

the inclusion of metaphor in the logic of scientific systems gave science the power to absorb the data of immediate intuition under the abstract concepts of the understanding -- i. e. under categorical forms.

36. L. L. Laudan argues that enthusiasm for Newton's theories reached their highest peak in those disciplines "where Newton's real achievements were obscured by what scientific non-initiates took them to be." The 18th Century, Laudan claims, "was Newtonian, not so much in its physics or its metaphysics, as in its conception of the aims and methods of science. ...It was Newton's...peculiar kind of empiricism -- rather than his optics or his mechanics that motivated the leaders (and the charlatans) of 18th Century English intellectual history" ("Thomas Reid and the Newtonian Turn of British Methodological Thought," Butts and Davis, Heritage, 104-131). For other treatments referring specifically to the idealizing tendencies of Newton's laws see David Kubrin, "Newton's Inside Out! Magic, Class Struggle and the Rise of Mechanism in the West," in The Analytic Spirit, ed. Harry Woolf (Ithaca, 1981), 96-121; Henry Guerlac and M. C. Jacob, "Bentley, Newton, and Providence: The Boyle Lectures Once More," Journal of the History of Ideas 30 (1969):307-318.

37. Butts and Davis, Heritage, 152-169.

38. Ibid., 75-77.

39. Newton, Principia, 5-6.

40. "External and internal sensation are the only passages I can find of knowledge to the understanding," Locke admitted. Reasoning proceeded through the examination of simple ideas which existed as discrete atoms of consciousness derived from experience. Complex ideas could be built up out of these cognitional atoms through the processes of association and abstraction. But complex ideas represented only subordinate forms of knowledge thoroughly dependent upon the immediate perception of the simple ideas out of which they were built. The "simple ideas" are absolutely central to Locke's epistemology. The primary references are Essay Concerning the Human Understanding, 2.2.1, 2.1.25, 2.2.2, 2.12.1, 2.12.2, 2.13.1, 2.13.28, 4.1.4, 4.18.3.

41. Ibid., 4.11.9.

42. For a fascinating discussion of the logical consequences of Newton's Rules, see Robert E. Butts, "Whewell on Newton's Rules of Philosophizing," in Butts and Davis, Heritage, 132-149. See also David B. Wilson, "Herschel and Whewell's Version of Newtonianism," JHI 35(1974):79-97.

43. Locke, Essay, 2.11.16, 2.12.18, 4.2.1, 4.17.14.



44. Ibid., 4.7.11; 4.3.26. Buchdahl develops the interesting argument that Locke, in fact, equated *scientia* with "unintelligibility". He claims that the logical ambiguity in Newton's methodology allowed Locke to make his crucial distinction between the province of empirical sciences and those truths which surpass all understanding. "To claim unintelligibility is at the same time to claim inductive prestige for Newton's conceptions," Buchdahl argues; "and *per contra*, Newton's successes guarantee that we need not be afraid of unintelligibility" (Butts and Davis, Heritage, 86-89).

45. Locke, Essay, 4.8.4.

46. Ibid., 4.8.4; 4.1.2.

47. Ibid., 3.3.11; 4.4.1-16. Locke offered a weak linguistic argument for abstraction (see Essay, 3.3.15, 3.3.16, 1.7.7), but ultimately acknowledged that it expressed a purely mental construct. For an interesting discussion of Lockean abstraction, particularly with relation to Descartes, see Peter Schouls, The Imposition of Method: A Study of Descartes and Locke (Oxford, 1980), 148-182. See also Ault, Blake, 61-69.

48. Howell, 18th Century, 280.

49. Laudan points out that the "Newtonian message" in fact produced scientific theories which were surprisingly un-Newtonian, concluding that on the crucial questions of scientific method and the philosophy of science "there seems to be very little evidence indeed that the early British empiricists were either very impressed by, or paid much heed to, Newton's much publicized views" (Butts and Davis, Heritage, 105).

50. Locke, Essay, 2.11. Turbayne goes so far as to claim that Lockean psychology as a whole described "the dioptricks, as it were, of the mind in perception" (Myth, 205).

51. See Berkeley's Commentaries, entries 429, 429a. For an interesting discussion of the relation of Berkeley's optical theories to 18th Century philosophy see G. N. Cantor, "Berkeley, Reid and the Mathematization of Mid-Eighteenth-Century Optics," Journal of the History of Ideas, 38 (1977):429-447; John W. Davis, "Berkeley, Newton and Space," in Heritage, 57-73.

52. See Treatise of Human Nature, I, i, sec. 4; Enquiry, section 4, part ii; Treatise, I, iii, sec. 1. For a perceptive discussion of Hume which places him firmly in the context of the logical issues relevant to this study, see Weinberg, Occam, Descartes and Hume, 92-112. Following Hume, Hartley attempted to construct a consistent

epistemology based on Lockean principles of association and Newtonian theories of physical vibration. But he ignored the primary question of the actual process by which physical sensations were transferred to the mental realm. He therefore offered no explanation for the origin of our knowledge and focused solely on the mechanism by which simple ideas, once formed, became abstract. Hartley himself seemed to remain essentially unaware of the extra-logical leap he had made. But his theories would have important consequences for the further development of English psychology (see Barbara Oberg, "David Hartley and the Association of Ideas," Journal of the History of Ideas 37 (1976):441-454). For an interesting discussion of Hartley's theories which place them directly in the context of Ramean logic see Walter Ong, "Psyche and the Geometers: Aspects of Associationist Critical Theory," Modern Philology 49 (1951):16-27.

53. John Stuart Mill, A System of Logic (New York, 1846), 171; Howell, 18th Century, 706. For a discussion of Mill's logic in the specific context of Ramean logic see Ong, Presence, 71-73 and Romance, 243-246.

54. Howell, 18th Century, 76.

Chapter 4  
ARISTOTLE, RAMUS AND DESCARTES:

Logical Metaphors  
in  
French Scientific Models

Just as Newtonian laws and Lockean epistemology reflected the logical and legal metaphors operative in English society during the 16th and 17th Centuries, so also did French scientific models reflect the logical and legal models upon which they drew. France, throughout the turmoil of the 16th Century, had maintained a native centralized absolutism. Its legal models continued to express an authoritarian ideal which conceived of laws as incontrovertible *dicta*, propounded unilaterally and imposed from above. These political structures precluded the introduction of legal metaphors based in inference. Moreover, whereas in England the liberalizing effects of Protestantism militated against the extension of dogma across the entire field of inquiry, in France the continued dominance of the Catholic Church tended to represent political, religious and intellectual orthodoxy as coordinate value-systems. As early as 1534, Francis I established a policy of monarchical control over the French

intellectual community.<sup>1</sup> This policy, reenforced by Jesuit ideologues, insured a level of control over the intellectual milieu in France which would have been impossible in the religious and political atmosphere of 17th Century England. As a result, logic in France through the 17th, and indeed much of the 18th Century, hued essentially to a party line grounded in absolutist metaphors and authoritarian ideals.

The Edict of Nantes sealed the fate of Ramism early in France. The implicit rhetorical focus of Ramean dialectic, to say nothing of its explicit identification with the Protestant cause, insured that Ramus would never receive in France the sympathetic hearing which he enjoyed in England. The need to convert, so central to English political and religious life, had no meaning in Bourbon France. So Ramean rhetoric found no audience. Likewise the anti-authoritarian valence of Ramus' dialectic made it unlikely that he would find a constituency among the politically dependent scholastics who served the French universities after Henry's accession. Henry's Edict left the field entirely to scholastic defenders of traditional Aristotelianism.<sup>2</sup>

As a result, French logic never felt the creative effects of the interplay between Ramean and Aristotelian metaphors which generated the Neo-Aristotelian theories of Wallis and Aldrich and supported Newton's formulation of

law as inference. The ultimate effects of Ramism emerged in absolutist France rather as a latent preoccupation with method which Ong claims "haunts the French mind." Where Ramism had served as a catalyst in the freer development of English logical theory, in France it served "as a crystal introduced into a supersaturated solution, suddenly precipitating and giving structure to the interest in method with which the scholastic world in Paris was charged."<sup>3</sup>

Descartes supplied the medium through which Ramean method precipitated into French logic and science. But Descartes' logic, although revolutionary in its mathematical insights, proved curiously conservative in its practical effects -- a consequence which derived explicitly from its primary dependence on method. Autonomous by nature and always self-identical in operation, Descartes' method provided the ground for his logic. So, unlike Newton, he had no need to enthrone experience as a new authority in inquiry. His innatist logic stipulated that the materials of knowledge were given to the mind by the mind.<sup>4</sup> Experience provided occasions for the application of method, not data for the operations of reason. Moreover, since his method guaranteed the perfect intelligibility of his system, Descartes had no need to justify his mathematics in existential terms. He could leave those questions of correspondence which had so confounded Newton in the hands of

traditional authorities and focus exclusively on the internal operation of reason within ideal mathematical constructs.

Predictably, this type of "scientific revolution" played well in the political atmosphere of 17th Century France. Descartes' acquiescence in a traditional ontology placed issues of authority outside the field of science. It divorced the unsettling discoveries of the new sciences from the inviolable claims of Church and State and cleared the path for an autonomous investigation of nature. Coincidentally it provided welcome support to an intellectual community committed at once to a revolutionary science and a conservative regime. Despite his appearance on the Index in 1663, Descartes consistently avoided any break with orthodoxy. In addition to having first obtained the sympathetic approval of the influential Cardinale de Bérulle and his Oratoire for his theories, Descartes continually tested his ideas against clerics such as Mersenne to determine their acceptability. He repeatedly professed a full submission to the articles of the faith and desisted from any test of methodic doubt in the realm of revelation.<sup>5</sup>

Moreover, Descartes furthered neutralized adverse reactions to his analytical model by propping up his mechanistic physics with an Augustinian doctrine of the spirit. Thus, although at first uniformly opposed by reac-

tionary Jesuit writers, Cartesian logic rapidly gained a hearing as a viable alternative to an Aristotelianism which was becoming increasingly untenable in the face of scientific advance. By 1662, Descartes' logic had become sufficiently respectable to acquire systematic expression in the *Logique de Port-Royale*, which Howell claims "achieved a phenomenal popularity in France." The Port-Royale Logic attacked the doctrine of the places as insufficiently methodical and the categories as unproductive of certain knowledge, establishing Descartes' theories of predication, as well as his deductive method, as the cornerstones of French science.<sup>6</sup>

Supported by apologists like Gassendi and Malebranche, Cartesianism was rapidly assimilated to the cause of orthodoxy. Pierre Gassendi early merged his atomistic theories with the corpuscular hypotheses of Descartes. Together the two conceptions lent strong support to the enterprise of explaining all natural phenomena in terms of bodies in motion. Indeed Gassendi's attempt to define the soul in relation to certain highly refined atomic movements found welcome justification in Descartes' automatist theories. Similarly Nicholas Malebranche concentrated on bringing the Cartesian theory of the vortices into correspondence with Mosaic physics. His theory of Occasionalism, anticipated by de la Forge and Cordemoy as early as 1666, proved central in reconciling Cartesian and

Catholic doctrine. Malebranche's "christianization" of the central tenets of Cartesian physics allowed for its full acceptance in the orthodox milieu. Varantian calls his work "the subtlest and profoundest apologetics of the age, converting innate ideas into a Christian-Platonic 'vision in God' and mechanistic dualism into a providential theory of occasional causes."<sup>7</sup>

Ultimately Bishop Bossuet brought Cartesianism right to the threshold of officialdom in his *Connaissance de Dieu et de soi-même*, which combined the Augustinian features of Cartesian psychology with the strong Thomistic tradition of the Parisian schools and made it acceptable in a university milieu committed to the maintenance of traditional forms. Even the Jesuits gave up in the end. Indeed they ultimately found in Descartes a powerful ally in the struggle against the deistic, materialistic and atheistic tendencies of the Enlightenment.<sup>8</sup> By the time of the establishment of the Académie Royale des Sciences in 1666, Descartes had become authoritative. To attack him invited official censure.

The acceptance of Cartesian logic by an authoritarian regime insured its metaphors a determining role in the creation of French scientific models. The ability of French universities to maintain a high level of orthodoxy, particularly in a discipline as central to the curriculum as logic, allowed the controlling metaphors of Cartesian



logic to penetrate the French intellectual milieu in a way which they could not in England. As a result, Descartes' reliance on deductive method and his desire to eliminate all vestiges of topical or categorical images in predication embedded themselves at the very center of French scientific inquiry.

Nor could the influx of Newtonian-Lockean theories of inference dislodge Descartes' deductive model. Locke's logic may, in fact, have been robbed of some of its initial impact by the circumstances which surrounded its introduction in France. Locke's *Essay* first appeared there in 1688 in the form of an epitome by Jean Le Clerc. But Le Clerc's work provided only a small portion of the text of the Essay. Howell points out that "in 1688 the *Essay* had not yet reached its completed form in Locke's mind, and thus the epitome which he submitted to Le Clerc was a reduced version of something not yet fully worked out. Such a version would inevitably be incomplete in emphasizing the basic points of the final work." Nowhere, Howell claims, is this more evident than in the treatment given by Le Clerc to Locke's explicitly logical theories, and particularly his critique of the syllogism. The capacity of this epitome to discredit the deductive theories of Descartes thus proved minimal.\*

Indeed not until the mid-18th Century did the hegemony of Cartesian logic in France begin to be questioned in any

fundamental sense. Varantian argues that the standard scholarship which claims that the theories of Newton and Locke submerged the Cartesian view is faulty at best and "typified by a reluctance to probe beneath the surface." Newtonian and Lockean metaphors, he contends, met with a "tenacious resistance from the majority of the members of the *Académie des sciences*." Although Descartes' physics itself began to be discarded in the face of the more objectively convincing Newtonian physics, the scientific methodology that had inspired it remained and proved to be the dominant factor in the development of French science. This accounts, Varantian claims, for the persistence of the *tourbillon* theory as late as the 1770's -- a theory which survived, not on any physical merit of its own, but rather because it conformed to the metaphors of science developed by Descartes.<sup>10</sup>

Indeed in 1752 Fontenelle lent the enormous prestige of the *Académie* to a defense of Cartesian physics in his *Théorie des tourbillons Cartésiens* which unequivocally supported the vortices against Newtonian attractionism. Significantly, Fontenelle's defense rested almost exclusively on an attack upon Newtonian inference. According to Fontenelle, Newton's method extended its mathematical metaphors without justification to the existential world. The fact that calculation confirmed Newton's law, he argued, did not in any way prove that attraction existed in the

material world. He pointed out that Descartes' mathematical laws, on the other hand, provided a matrix which need not necessarily extend to material reality. Cartesian laws expressed the world *en tant qu'elle est comprise par l'entendement*, unlike their Newtonian counterparts, which defined a universal standard to which all reality, through inference, must conform. Working from the deductive postulates of Cartesian logic, Fontenelle explicitly denied Newton's right to bridge the gap between theory and reality with an inferential logic.<sup>11</sup>

Likewise Condillac, although ostensibly supporting Lockean inference in his *Traité des sensations* in 1754, in fact relied on the "esprit de système" still so powerful in the Cartesian tradition to carry him beyond Locke to a theory of knowledge which buttressed established religion and defended traditional metaphysics. Etienne Gilson points out that Condillac "shows himself a disciple of Descartes more than of his beloved Locke."<sup>12</sup> In fact, his *Essai sur l'origine des connaissances humaines* sought, not to propagate Lockean theories in France, but rather to correct what its author saw as several serious defects in Locke's own *Essay*. Condillac pointed out that Locke ignored the central question of how the understanding achieved the transition from sensation to cognition. In effect, he pointed out that Lockean theories of inference had the same difficulty dealing with issues of cor-

resonance that Fontenelle had identified in Newtonian physics. Although ironically characterized as the champion of Locke in France, in fact Condillac's aim was to bring to completion a logical task which he felt Lockean inference left incomplete.<sup>13</sup>

The *Académie* remained sufficiently in thrall to "la grande idée de Descartes" in 1765 to endorse an official *Eloge* to its author. In fact, throughout the entire period characteristically styled the "Age of Newton," Cartesianism remained the official position of French science. Even in defeat, the metaphors of Cartesianism triumphed in subtle and telling ways. "The decline of Cartesianism was not exactly a rout," Varantian points out. "There is reason to believe rather that it was an orderly, even if inexorable, retreat. It left behind many all-embracing vestiges, which proved all the more effectual for being too 'intangible' to be challenged by the philosophes."<sup>14</sup>

A perfect example of the tenacity of Cartesian logic in the French scientific world appears in the work of Christian Huygens, whose brilliant theoretical work on oscillating pendulums attacked one of the toughest dynamical problems of the age. Huygens sought to calculate the center of oscillation of a compound pendulum. His experiments and calculations brought him to make potentially important observations on the operation and magnitude of centrifugal force. Huygens clearly possessed the gifts and

the data to apply these observations to the development of a comprehensive theory of centrifugal or even gravitational force. But Huygens "was in bondage too long to Descartes' philosophy." He accepted as given Descartes' logical deduction of the vortex as an invisible "subtle matter" which caused the restraining effects he observed in his pendulum experiments. He therefore ignored the theoretical impact of his own observations, explaining them rather by reference to Cartesian mechanics. Likewise, in his important work with vacuum pumps and optics, Huygens dismissed the theoretical implications of his own experiments and "bent" his results to accommodate the Cartesian *plenum*.<sup>15</sup> By so doing, he left the field to Newton.

The entire difference between the scientific models developed in England and France during this period can in fact be expressed by the metaphors implicit in their respective logics. As discussed above, Newton identified inference as the operative principle in the construction of laws. But inference, from the Latin *inferre*, means "to carry toward" or "bring into". Thus for Newton, laws expressed the product of a method which reached outside the inquiring mind to "bring into" the reasoning process the data of external experience. The scientific mind in fact went through an actual legislative process in the construction of laws not unlike the process pursued by political minds in the construction of positive law.

Descartes' logic, on the other hand, operated through deduction, from the Latin *deducere*, "to lead away from" -- or, even more significantly, the French *déduire*, "to deduct," "to draw out," "to discourse of."<sup>16</sup> Deduction provided Descartes with a means of explaining ideas which were logically prior to the process of inquiry itself. But while deduction could "draw out" concepts from a logically antecedent system, it contributed nothing to the creation of that system in the way that Newtonian inference did. In fact, Descartes consistently held that experience remained extrinsic to his method. While it might supply middle terms useful in determining the correctness of a judgement made about a scientific system, it had no logical status in the construction of laws.

D. M. Clarke makes some perceptive comments on the ambiguous senses of the word experience in Cartesian writings, claiming that at no point in his works does Descartes use the word experience in a sense even roughly parallel to the sense in which Newton uses it. "Descartes' concept of experience," he notes, "is not univocal, nor does he normally reserve any special term to discriminate between scientific experiments and any other empirical procedures which might be more generally classified as experience. Instead he uses the word *expérience* in French and *experientia* or *experimentum* in Latin and their corresponding verb forms *expérimenter* and *experiri*, in as many senses as we

ordinarily use the words "experience" or "to experience" in English. In a few cases he also uses *épreuve* (and *éprouver*) and *sentiment* (and *sentir*) with almost the same ambiguity of meaning as *expérience*. The Cartesian repertoire does not, however, include the word *expérience*.<sup>17</sup>

Hence "experience" in the sense in which Newton used the word, had no logical status for Descartes. This may account for Descartes' inclination to be so "unambiguously hypothetical" in works like the *Dioptrics* and the *Meteorology*. Where Newton felt the need to disguise his hypotheses as inferences, Descartes could acknowledge them for what they were because of his disinclination to justify them in terms of objective experience. Thus Cartesian laws supplied the source of a method whose role consisted in the explanation, not the legislation, of concepts. In a very real sense they expressed the absolutist frame within which political law operated in France throughout the 17th Century. Within that frame, Reason reigned supreme. Outside it, Reason had no jurisdiction at all.

But the comfortable accommodation of Cartesian logic to the French political scene dissolved rapidly with the rise of Jacobin power. The explicit conservatism of Cartesianism could not readily supply a nascent Republican movement with metaphors appropriate to the overthrow of traditional authority. The *libertins* required a logically

sound theory of law which could justify their revolutionary aims and still provide a philosophic base for the establishment of a stable regime. Yet when they looked to their logic for metaphors which could sanction their political activism, they found only deductive models which tended rather to reenforce traditional forms. The logic in which they had been schooled provided no opportunity for developing legislative models grounded in inference. Diderot, for instance, received his formal schooling at the Collège d'Harcourt in the late 1720's under Guillaume Dagoumer, a professor of philosophy who had championed the introduction of Cartesianism in the Schools. Diderot entered the Collège shortly after Dagoumer had succeeded in establishing Descartes as the center of the school's philosophical program.<sup>18</sup> Likewise his fellow *encyclopédistes* matured in an intellectual atmosphere where "almost all learned societies [were] permeated...with the conception of science proper to Cartesian tradition."<sup>19</sup>

For want of logical metaphors which could support their political program, the *libertins* reached out instead to the latent implications of Descartes' innatist theory of predication. The potentially radical aspects of Descartes' "lumière naturelle toute pure", previously kept in check by the political conservatism of the 17th Century, emerged in the 18th as a beacon to free-thinkers and skeptics.<sup>20</sup> Reformulating Descartes' innatist images in a political



vocabulary, the *libertins* succeeded in fashioning a characteristic conception of natural law which, although revolutionary in its political effects, remained curiously consistent with the conservative metaphors of Cartesian logic. This implicit, if rarely acknowledged, adoption of Cartesian method by Enlightenment ideologues proved crucial to the development of 18th Century French thought.

Almost all French writers in the *âge des lumières* explicitly denied any debt to Descartes. In fact, Descartes acquired a certain propaganda value for a libertinism which sought to discredit all traditional authorities. Moreover, inasmuch as the innatist metaphysics of official Cartesianism represented a position which the *philosophes* unanimously rejected, they understandably refused in good faith to be styled Cartesians. Not until the 19th Century, in fact, had French criticism recovered sufficiently from the trauma of revolution to accept at face value the contributions which Cartesian logic had made to the development of Enlightenment thought. By 1891, Hippolyte Taine could admit that the innovations of the *philosophes* were deeply rooted in Cartesian images and that, notwithstanding the superposition of Lockean and Newtonian theories, they derived from an essentially *a priori* conception of scientific method.<sup>21</sup>

Nonetheless Cartesian metaphors emerged clearly in works like Montesquieu's *Esprit des lois*, which articulated

a concept of natural law fundamentally different from the physical laws which controlled Newtonian science. Newton's mathematical laws expressed *a posteriori* concepts -- abstractions inferred from the infinite variety of nature. But Montesquieu's natural laws existed *a priori*, as necessary relations that derived from the quantitative structure of the world. Within a cohesive world of matter in motion, Montesquieu identified "permanently established relations" -- operative ideals actually inherent in the constitution of things.<sup>22</sup> These "natural laws" controlled the effects of nature in a manner not unlike the way innate ideas controlled Cartesian logic. By following the light of reason, men could deduce the rules of political association from them, but the resultant positive laws, as deductive extensions of anterior relations, remained essentially dependent on natural law itself, just as the deductive conclusions of Cartesian logic depended ultimately on its intuited premises. Natural law remained logically antecedent to authority, just as intuition remained logically antecedent to inquiry. From this fundamentally Cartesian conception of law, the *philosophes* deduced their entire political program. And, in turn, this theory of natural law supplied metaphors for the construction of a scientific model peculiar to Jacobin France.<sup>23</sup>

The "universality" of Descartes' method gave it the implicit ability to extend its metaphors with equal ease

across political platforms or scientific agendas. In fact, under the potent influence of Jacobin politics, the investigator of nature became the guide and benefactor of society. Many of the themes animating the political ideologies of the Enlightenment -- human progress, moral perfectability, obligation to posterity -- derived directly from a method which seemed to promise that the penetration of the secrets of physical nature would furnish a corresponding competence in all areas of human concern. This tendency in Descartes' universal method provided the "côterie holbachique" with an excuse for referring all moral and social questions to the laws of matter in motion. And although Diderot would criticize this physico-determinist conception of human affairs, it nevertheless exercised a determining influence on the social theories of the Enlightenment, ultimately issuing in Condorcet's *Prospectus of a Historical Picture of the Progress of the Human Mind* which sought to establish an actual physics of social facts whereby it would become possible to engineer the political conduct of nations.

The protean images which supported natural law appear fully developed in the *Encyclopédie*, sacred book to a new cult of scientific naturalism which developed in France at precisely that point in time when Newtonian physics, according to the prevailing wisdom, should have been at the height of its influence. In fact, however, the naturalism

developed by the *encyclopédistes* differed radically from the models developed under the metaphors controlling Newtonian science. Newtonian inference had spawned a physico-mathematical universe governed by an assumed isomorphism between mathematical laws and the natural order. Locke had further restricted the scope of this model by subjecting it to a rigidly empirical epistemology. The end result was an experimentalism constrained by discrete data which offered at best a somewhat disjointed explanation of an inferred order. The *encyclopédistes*, by contrast, ignored the issues of correspondence which plagued Newton's inferential logic. By conceiving of law as antecent to inquiry, they eliminated contingency as a constituent of their models. This in turn fostered a physics committed to an absolute coherence in nature. And this faith in the integral lawfulness of all natural processes ultimately encouraged the development of scientific naturalism.

The naturalism of La Mettrie, Buffon and Diderot acknowledged the right of science to give the most complete interpretation of the physical universe within the compass of human reason, not merely human experience. It subordinated experimental procedure to a method of hypothetical deduction which, driven by Cartesian metaphors, allowed the mind to grasp the essential order of all physical phenomena. Experience itself provided only "several iso-

lated and disjointed fragments of the great chain that unites all things," Diderot declared in his *Interprétation de la nature*. One of the principal differences between a simple observer and a scientist, he argued "is that the latter starts out from the point where sense-perception and instruments abandon the former. ...From the order of things he draws abstract general conclusions...[and] rises to the essence itself of that order."<sup>14</sup>

The *Encyclopédie* article on *Hypothèse* clearly sought to vindicate this method.<sup>15</sup> But the naturalists' hypotheses operated on a different level entirely from Newton's, being primarily imaginative constructions suggested by certain key phenomena. In fact, for the *philosophes*, hypotheses proved true or false, not as they corresponded to present fact, but rather as they demonstrated an ability to lead to fresh hypotheses. Varantian even argues that in the naturalists the ideas of hypothesis and system in effect merged to form a single concept.<sup>16</sup> Indeed Voltaire alone among the *philosophes*, strongly influenced as he was by Lockean and Newtonian constructs, showed a signal incomprehension of the scientific use of hypothetical constructs, calling them only "suppositions".

The "esprit de divination" made manifest in the *philosophes'* legitimation of hypothesis underwrote a scientific method which stood as a polar opposite to Newton's physico-mathematical model. Its overtly hypothetico-

deductive method tended to diminish the importance of mathematical analogies in physics and to explain nature rather in its concrete and variable effects. Diderot, in fact, argued that "the object of the mathematician has no existence in nature," while Buffon agreed that "that which is called mathematical...possesses no [objective] reality."<sup>27</sup> The *philosophes* in general maintained that mathematical science remained "idealistic" in that its laws applied only under certain absolute conditions which need not actually exist in nature. It remained true ultimately, not to physical reality, but only to its own primary definitions. Naturalistic science, they argued, thus actually represented a truer experimentalism by accounting hypothetically for physical events in all their diversity and variability. Although Diderot early in his career experienced a fascination for mathematical science, by 1748 he could claim that "if mathematical subjects were once most familiar to me, to question me today about Newton would be to speak to me about last year's dream."<sup>28</sup>

By releasing physical reality from the mathematical constraints of Newtonian physics, the naturalists guaranteed a maximum degree of autonomy to their investigation of phenomena and prepared the way for an entirely independent and mature philosophy of nature. Indeed from the point of view of physical science, the convergence of a hypothetico-deductive method with Enlightenment legal

models had the great advantage of extending the field of inquiry across a multitude of phenomena which had been methodologically excluded from previous scientific models. Descartes had consistently subordinated his physics to an orthodox ontology. Although he had supplied a concrete instance of how a vast cosmogonic deduction might be carried out in his *tourbillon* theory, he had hedged it round with so many disclaimers in order to accomodate it to Mosaic physics that it had lost its effectiveness as an actual physical hypothesis. Newton, constrained by his inferential logic, had endeavored to fit his physical laws into a teleological scheme which could account for their operation in the world. But he had left the key to his clock-work universe in the hands of a Great Conserver who had no logical status.

By contrast, the *philosophes* built their scientific models on the logically antecedent structures of natural law. This allowed them to portray the processes of nature as inherent properties of matter which required no ontological or teleological explanation. They could therefore view the Cartesian postulates of matter and motion as ultimate principles of *physical* causation. This in turn encouraged them to construct cosmogonic theories which encompassed the entire natural order from its most minute organic effects to its most remote causal principles.

By dismissing ontological causes and teleological effects from their physical constructs, the *philosophes* released not only the materials but the mechanisms of nature to scientific investigation. They rendered the cosmos an active and dynamic organism which developed through the continuous processes of matter in motion, thereby divesting it of the static qualities which had characterized the Cartesian model, as well as the passivity which had constrained the Newtonian. Moreover, the *philosophes*, through an analogical extension of the metaphors of natural law, demonstrated that the natural order would in fact continue to operate indefinitely in conformity with its present effects through the subsistence of its physical causes. They described nature as "a ceaselessly active worker who knows how to utilize everything; who, working on her own initiative with always the same materials, far from exhausting them, renders them inexhaustible: time, space and matter are her means, the universe her object, motion and life her ends."<sup>19</sup>

From this naturalistic vision of dynamic matter in perpetual motion, grounded in the metaphors of natural law and innatist logic, La Mettrie would deduce his vitalist biology. Indeed La Mettrie's *Homme machine* described a logical extension of Descartes' automatism. A cross reading of the basic assumptions of the *Traité de l'homme* and *Le Monde* made it superfluous to consider the role of non-material



factors in animal faculties and conduct. Moreover, the central tenet of Cartesian physics that all organic phenomena derived uniformly from matter in motion supported a belief in the continuity of all living forms. Further encouraged by pertinent discoveries in zoology -- Trembley's discovery of the "polyp," Bonnet's disclosure of parthenogenesis, Needham's discussions of spontaneous generation -- La Mettrie moved beyond Descartes' automatism to a theory which dissolved the traditional barriers between animal, vegetable and human natures and established the natural history of the soul as a phase in the natural history of the body. In a brilliant hypothesis, La Mettrie introduced the powerful concept of *organization* as a determining force in nature, describing a cosmos continually and progressively organizing itself and expressing this organization through organic as well as inorganic functions. The epistemological consequences of La Mettrie's theories reached out across all disciplines, focusing attention particularly on the mechanisms of learning and the development of symbols.

Diderot, perhaps more than any other *philosophe*, accepted the metaphors of natural law as constituent elements in nature. But in the light of scientific advance in general and La Mettrie's vitalistic biology in particular, he ceased to view natural law as an immutable rationalist construct and began to view it rather as a dynamic concept

grounded in organic unity. In other words, he came, through La Mettrie, to lay emphasis on the empirical basis and pragmatic effects of natural law rather than on its metaphysical content. In his *Eléments de physiologie*, he presented a cosmos in a state of perpetual construction and reconstruction consistent with the laws of moving matter. But within this frame, Diderot ascribed an actual developmental pattern to organic processes which added a dimension of progress to the mechanisms of nature. Ultimately Diderot's naturalistic science would have its greatest and most lasting effect in the fields of ethics and social theory, issuing in works like Condorcet's *Prospectus*.<sup>30</sup>

The work of the *philosophes* established French science in a trajectory which would carry it from naturalism to positivism in the next century. Laplace's celebrated nebular hypothesis, Lagrange's work on the conservation of energy and Lamarck's evolutionary chemistry are all examples of the determining influence of Cartesian metaphors, via naturalistic theory, on the development of French science. Laplace's formulation of a purely material theory of creation earned him renown as "the Newton of France" -- not without some irony, since his theories systematically refuted some of Newton's central assumptions about the nature of the solar system. Beginning from his nebular theory in his *Exposition du système du monde* (1796),

Laplace deduced the essential stability of the universe, showing that the disturbing irregularities which had led Newton to fall back on teleological explanations were actually periodic and contained within narrow limits. His reliance on metaphors of inherent lawfulness allowed Laplace, in a now famous aphorism, to dismiss as irrelevant "that hypothesis" of divine intervention with which Newton had shored up his physics.<sup>31</sup>

Likewise Lagrange, in his *Mécanique Analytique* (1788) made use of the concept of potential introduced into natural science by the *philosophes* in order to complete Newton's work on the conservation of kinetic energy. By introducing potential into Newton's essentially static calculations of force, Lagrange laid the groundwork for important advances in the fields of magnetics and electrostatics. Most significantly in the present context, Lamarck developed the philosophical bases of Buffon's natural history into a full-blown chemical theory of evolution which provided a materialistic explanation for the generation and gradual development of all organic functions.<sup>32</sup> Moreover, he offered his naturalistic theories in direct opposition to the "new chemistry" being developed by Lavoisier under Newtonian models.<sup>33</sup>

Thus, just as the Neo-Aristotelian biases of English logic and methodology had helped to shape the models of English science, so also did the Cartesian metaphors

embedded in the French intellectual milieu have a determining impact on its constructs. In England the operation of Neo-Aristotelian metaphors encouraged the development of an inferential logic and generated a physico-mathematical science which drew on domestic legislative paradigms. When further circumscribed by Lockean epistemology this scientific model issued in an empiricist, and ultimately, a materialist philosophy. In France, on the other hand, the universal acceptance of Cartesianism by a conservative regime encouraged the development of a deductive logic and generated a mechanistic science which relied on an authoritarian ideal. Further modified by Jacobin theories of natural law, French scientific models developed in the direction of naturalism, and ultimately, positivism. Once again the joint operation of legal and logical metaphors conspired to generate a characteristic body of theory which clearly reflected the intellectual tradition out of which it grew.

### CHAPTER NOTES

1. Kelley describes the Parisian Studium as a "virtually totalitarian structure intended not only for the indoctrination but also for the moral and physical control of its members." For a discussion of the events surrounding the Affair of the Placards in 1534 see Kelley, Ideology, 129-169.

2. Ong observes that Ramean dialectic "made a poor showing [in France] and left Parisians generally unconvinced", while Ramean rhetoric "did not really disturb the older [Aristotelian] pattern very much" (Ramus, 297). In fact, according to Ong's Inventory, while some 13 Ramist logics appeared in France between 1555 and 1580, there were no Ramist logics published in France between 1580 and 1641, and only one thereafter.

3. Ibid., 297.

4. By contrast, for Newton and Locke, the materials of knowledge were given to the mind by objects through the operation of the senses. All sentient states were grounded in sensory, not mental, experience. For a direct comparison of these doctrines, refer to Newton's "Rules", Descartes' *Regulae* and the fourth book of Locke's *Essay*. For a related discussion of the epistemological and methodological stances of the three see Schouls, Imposition, 21-31.

5. Varantian points out that "the philosopher's 'prudence', in this regard, has become classic" (Diderot, 34).

6. Howell, 18th Century, 53. For a discussion of Descartes' influence on Port-Royale and its consequent influence on French logical theory see Howell, Logic, 342-381.

7. Varantian, Diderot, 37.

8. See Gaston Sortais, "Le Cartésianisme chez les Jésuites français au 17e et 18e siècle," Archives de Philosophie, Vol vi, cahier iii (1929):92. Varantian concurs, noting that the result of this accommodation was to convert Cartesianism into an arm of the political establishment with which the authoritarians hoped to frustrate the goals of the Enlightenment (Diderot, 36-43). See also Bell, Newtonian Science, 75-78.

9. Nonetheless Le Clerc went on to produce a French

version of Locke's logic based on this truncated version (*Logica*, 1692). For a discussion of Le Clerc's logic and his interpretation of Locke see Howell, *18th Century*, 300-304.

10. Varantian, *Diderot*, 136-139.
11. See *Oeuvres* (Paris, 1766), 311-312.
12. Gilson, *Modern Philosophy*, 279.
13. See *Essai sur l'origine des connaissances humaines*, bk. I.
14. Varantian, *Diderot*, 41.
15. See Bell, *Newtonian Science*, 88-98. Bell observes that "perhaps if he had not assumed some kind of fluid pressure to be the cause of gravity he might have anticipated Newton in his great discovery."
16. The first edition of the French Academy Dictionary in 1694 lists "deduct" or "subtract" as the primary meaning of *déduire* and then adds "il signifie aussi narrer, raconter au long & par le menu." A *deduction* is described as a "narration, énumération en détail". D. M. Clarke claims that the Cartesian word *déduire* corresponds to *démontrer* (*Descartes' Philosophy of Science* (University Park, Pa., 1982), 207-209).
17. Clarke, *Descartes' Philosophy*, 17-47.
18. See H. L. Bouquet. *L'Ancien Collège d'Harcourt et le Lycée Saint-Louis* (Paris, 1891), 334-335, 348.
19. Varantian, *Diderot*, 40.
20. Ultimately, of course, this radical potential became actual in the Romantic ideology of Rousseau, who explicitly relocated legal metaphors *within* the individual. The individual himself consequently became both the creator and guarantor of the political order. Judovitz claims that this relocation marks a decisive shift in legal models "away from the state (polis) as the city of men, to the city as a metaphor for a single man" (*Subjectivity*, 105).
21. See *Les origines de la France contemporaine: L'Ancien Régime* (Paris, 1891), 263.
22. Montesquieu, *Oeuvres complètes* (Paris, 1875), vol. 3, 90-91.
23. Several scholars have, in fact, argued for the

existence of a distinct phenomenon called "Jacobin science". See Charles C. Gillespie, "The Encyclopédie and the Jacobin Philosophy of Science: A Study in Ideas and Consequences," in Critical Problems in the History of Science, ed. Marshall Clagett (Madison, 1959), p255-289 and "Probability and Politics: Laplace, Condorcet and Turgot," Proceedings of the American Philosophical Society 116 (1972):1-20; Leslie J. Burlingame, "Lamarck's Chemistry: The Chemical Revolution Rejected," in The Analytic Spirit, 64-81; Maurice Crosland, "The Development of Chemistry in the 18th Century," Studies on Voltaire and the 18th Century, 24 (1963):369-441; Roger Hahn, "Laplace and the Vanishing Role of God in the Physical Universe," in The Analytic Spirit, 85-95.

24. Diderot, Oeuvres, vol.2, 12, 53.

25. See Encyclopédie, ou Dictionnaire raisonné... (Paris, 1751-1765), vol.8, 417-418.

26. Varantian, Diderot, 166-170.

27. Diderot, Oeuvres, vol. 2, 10; Buffon, Oeuvres complètes (Paris, 1853-1855), vol.1, 28.

28. Diderot, Oeuvres, vol. 9, 168-169.

29. Quoted in Varantian, Diderot, 305.

30. For a discussion of Diderot with relation to La Mettrie see Varantian, Diderot, 47-135. For a discussion of the ethical and social consequences of Diderot's naturalism see Gilson, Modern Philosophy, 320-328.

31. For a discussion of the theories of Laplace as they relate to Newtonian physics see "Laplace and the Vanishing Role of God," in The Analytic Spirit, 85-95.

32. See Recherches sur l'organisation des corps vivans, 1802.

33. For an explicit juxtaposition of Lamarckian chemistry to physico-mathematical models see "Lamarck's Chemistry: The Chemical Revolution Rejected," in The Analytic Spirit, 64-81. For a description of the advances made on Newton by Lagrange see Bell, Newtonian Science, 121-130.

Chapter 5

RAMUS, LEIBNIZ AND WOLFF:

Logical Metaphors

in

German Scientific Models

In contrast to the respective receptions which it received in England and France, in Germany Ramean logic emerged as the controlling dialectical theory. Interacting with a native Rhenish humanism and a tradition of customary law, Ramism there assumed its classic form as a master guide to the organization and transmission of all knowledge. Propelled by a thriving publishing industry and institutionalized by systematic educational reform, Ramean dialectic embedded itself in the uppermost reaches of the German curriculum and established itself there as the metaphoric ground of all inquiry.

Ong speculates that the greater age of the French and English universities prevented Ramism from producing any comprehensive approach to the higher branches of knowledge. But "the German universities," he points out, "were relatively new, their accumulation of tradition thinner, so that the didactic drive indigenous to the whole university movement, appears in Germany unmasked and bare. ...Else-



where the Ramist reorganization of the curriculum tends to affect chiefly the rhetorico-dialectic dyad. ...In Germany, however, its diagrammatic approach to knowledge fires the imagination of polyhistorians and of codifiers of all the sciences, so that Ramist method moves into the uppermost branches of the curriculum with a drive which cannot be matched in any other country."<sup>1</sup>

Ong's Inventory bears this out. Editions of Ramean texts produced in Germany and Switzerland outnumber their English counterparts by more than three to one and their French counterparts by more than seven to one (259 in Germany to 75 in England and 35 in France). Even more significantly in the present context, the bulk of the Ramist texts produced in Germany between his death in 1572 and the end of the 17th Century were logics, not rhetorics. While by contrast in England the balance is clearly weighted in the opposite direction, in Germany Ramean *Dialectics* outnumber Ramean *Rhetorics* by more than two to one (149 to 65). The picture appears roughly the same for Switzerland (25 Logics and 17 Rhetorics) and the Alsacian regions, which produced no Rhetorics at all, only Logics. In fact Ong's Inventory names 34 cities in Germany, Switzerland and Alsace which saw the active production of Ramean texts, as opposed to only five in France and four in Scotland and England.

Ramean theories entered Germany early. Ramus himself spent several years there as a royal commissioner to the Rhineland and travelled extensively throughout Germany during his exile from Paris, lecturing frequently from Basle to Heidelberg and as far east as Nuremberg. Ramus found the philosophic soil of Germany well-conditioned to support his dialectic by earlier Rhenish manualists such as Caesarius, Titelmans and Sturm, all of whom had carried on the logical traditions of Agricola within the broader outlines of Northern Humanism. Anti-Aristotelian in spirit, these German manualists emphasized what Ong calls the "Agricolan development" in logic -- that is the centrality of judgement and invention, rather than predication, to the logical process.

Johann Sturm, Ramus' mentor at the University of Paris, played a particularly important role in preparing the way for Ramus in Germany. It was Sturm, in fact, who had first brought Agricolan logic to Paris, where he taught from 1529 to 1536. In 1538, Sturm returned to Germany to open a gymnasium at Strasburg where he expounded a logic firmly grounded in Agricolan principles. Kelley calls Sturm "the guiding spirit of [the Protestant] pedagogical enterprise" and comments on the "spectacular growth" of his academy.<sup>2</sup> The natural links between Agricolan method and Protestant paedia insured that Sturm's logic would thrive, not only in Strasburg, but throughout the sphere of Protestant

influence in southern Germany. Moreover, the scholars trained at his academy, particularly Hotman and Bucer, played a central role in establishing Ramism at the heart of the educational establishment in the theocratic South.<sup>3</sup>

This prior conditioning, Ramus' acknowledged skill as a rhetorician and teacher and his developing Protestant affinities, all combined to insure that Ramean theories would receive a sympathetic hearing in the Rhineland and earn a place there as a viable alternative to the logic of the Schools. Moreover, Melancthon's *Loci communes* had prepared Rhenish audiences to accept Ramean dialectic as a powerful tool for the conversion of Saints and the indoctrination of the faithful. A conspicuous martyrdom underscored the natural ties between Ramism and militant Protestantism, while the publisher André Wéchel's emigration to Frankfurt am Main in 1572 provided German Ramists with a powerful domestic organ for the dissemination of their method.<sup>4</sup> By prompting the flight of many other influential Huguenot exiles to the cities of South Germany in 1598, the Edict of Nantes further enhanced the Rhineland as a natural seedbed for Ramist doctrines.

The theocratic atmosphere of the South German cities proved particularly well-adapted to receive the message of Ramism. The convergence of a powerful dialectical method with the needs and aims of the sacral communities along the Rhine assured that Ramism would flourish there. Sig-

nificantly, not all German cities, nor even all German Protestant cities, found Ramism appropriate to their needs. Ong observes that Ramism "was most intense in the sectors of Germany...[which] correspond roughly to the Rhineland and its environs and weaker in the more Lutheran parts of the country," pointing out that "theologically, Ramus stood for a mild Zwinglianism." "Most Lutherans," he claims, "and many others who were in the heat of the religious fray paid [Ramus] little heed and less respect."<sup>5</sup> Perry Miller agrees, stating that Frankfurt "seems to have been the continental center [of Ramism]," and pointing out that, although the Southern cities "were in general inclined to Ramus," Lutheran cities maintained their allegiance to Aristotelian doctrine.<sup>6</sup>

In the context of the present argument, some related observations made by Stephen Ozment provide an interesting aside. In attempting to identify reasons for the distinctive development of Lutheranism as a coherent orthodoxy in the Late Reformation, Ozment compares its decidedly unsystematic structure with the highly systematic ecclesiology which emerged in the free cities of the South. He concludes that Lutheranism remained "intentionally unsystematic" due to its politically dependent position within the Principalities. While this, of course, is true (and incidentally serves to bolster the current argument), Ozment only briefly touches on what this author sees as a

much more telling issue. "Unfortunately," he observes, "scholars have so far evinced scant interest in how the Lutheran version of Latin Christianity was conveyed to what amounted to two generations of Lutheran pastors. ...Who taught them? How, in detail, were they taught? ...The very methods the Lutheran theologians used may have had effects upon their conclusions."<sup>7</sup>

The foregoing discussion suggests that the lack of systematic structure which Ozment describes derived, not only from the different legal models which characterized the Principalities and the urban South, but also from the different logical models which underwrote their respective educational systems. The universities in the Lutheran cities retained Aristotelian logical doctrines at the core of their curriculum. Indeed Lutheranism, with its Augustinian view of the spirit, encouraged the use of theological images which could accommodate the assertoric predicates of Aristotelian logic. Moreover, the legal metaphors implicit in the *herrschaft Recht* which operated within the Principalities reflected structures of rank and estate which correlated directly to the categorical structures of Scholastic logic.

All these tendencies militated against the adoption of topical metaphors. The mediated nature of premises obtained through invention, as well as the leveling tendencies of the "commonplaces" made topical logic unacceptable

to both the religious and political forces behind Lutheranism. Thus, the "cult of method", which found such a congenial home in the theocratic communities of the south, never penetrated the "priesthood of all believers" in the Lutheran strongholds of central and northern Germany. Consequently, the compulsion to systematize endemic to the topical tradition never drove Lutheran ideologues as it did Zwingli and Bucer. This difference in the logical substructures of Lutheranism and the Reformed Churches of the South undoubtedly contributed to the distinctive evolution of their respective confessions.

Clearly the priority given by Ramus to the communication of knowledge provided welcome support to the burgeoning evangelical movements based, for reasons of spiritual and intellectual affinity, as well as political necessity, in the Southern cities. Protestantism in general relied heavily on didactics and encouraged a view of education as a tool for both social and spiritual control. In the cities of South Germany, this didactic charge merged with the characteristic urban notion of education as a public responsibility essential to the preservation of civic ideals. The strong pedagogical bias of Ramism could handily support programs of public indoctrination designed to shore up civic virtue as well as catechize the faithful. Driven by the powerful notion of method, the Protestant Academies which opened in the cities along the Rhine

rapidly became effective arms of their respective ecclesiastical and political establishments.

Chief among the educational centers which actively propagated Ramean theories was the High Academy at Herborn, located southwest of Marburg in the heart of Rhenish Reformed Protestantism. Here an influential group of Philippo-Ramists -- so called for their attempts to reconcile Ramist doctrines with the logic of Melancthon -- systematically applied the methodological tenets of Ramism to everything from theology to education to politics. Bartholomew Keckermann, along with others such as Johannes Piscator and Andreas Libavius, maintained Ramean method as the natural means of pursuing knowledge and relied on the familiar Ramist dichotomies to display the results of inquiry. The group as a whole continued to view knowledge as "encyclopedic" -- hence their characteristic title of the Herborn Encyclopedists -- and upheld the topical method as the key to the circle. These Philippo-Ramists, also known as Mixts or Systematics, succeeded in maintaining Ramean theories at the forefront of the German academy throughout the 17th and 18th Centuries.<sup>8</sup>

Through their continuing emphasis on pedagogy and their attention to the collective aspects of knowledge, the Phillippo-Ramists provided the cities with powerful dialectical tools for the defense of their besieged communal values. The structural elements implicit in Ramist doc-

trine not only satisfied the ideological needs of the cities but supplied them with a set of logical metaphors which vindicated their uncertain legal status within the Empire. Significantly, however, the Ramism which developed in the urban enclaves along the Rhine never underwent the major revisions which had reoriented English Ramism. In England, substantial changes had been necessary to make Ramean theories acceptable to a strong Aristotelian lobby and a tradition of parliamentary law. But in Germany, interacting as it did with a native logical tradition grounded in the Agricolan places and a legal tradition grounded in the *altes Recht*, Ramism escaped drastic revision and maintained its explicitly dialectical focus. In the urban South, Ramean metaphors could merge with the broadly topical logics of Melancthon and Sturm to produce a theory of inquiry which maintained the original contours of Ramism.

Under the sponsorship of influential educators, and propelled by its own internal penchant for didactics, Ramism quickly became a part of the "sinews and bones" of the Rhenish educational establishment.<sup>9</sup> Carried throughout Germany and most of Southeastern Europe by the systematic educational reforms of Johann Comenius in the 17th Century, Ramean method, reborn as *pansophism*, became a part of the intellectual baggage of countless German scholars who, in



turn, helped to shape the German intellectual milieu for generations to come.

Comenius, a Moravian educator trained at Herborn by Heinrich Alsted, clearly followed in the footsteps of Johann Sturm. Combining the teachings of Alsted and Sturm, Comenius developed an expanded version of Ramean didactics whose success relied, in his own words, "entirely upon a suitable supply of encyclopedic textbooks" intended to cover the whole range of the curriculum -- methodized, of course, according to Ramist principles. Dovetailing handily with the Protestant "cult of the Book" as well as with the pedagogical bias of Ramism in general, Comenian educational principles became deeply embedded in the German educational system through a series of reforms of Grammar schools and Gymnasias undertaken at the request of authorities in Sweden, Prussia, Bohemia and Moravia. Through Comenius' efforts, preparatory schools throughout Germany became so thoroughly immersed in overtly Ramean textbooks and procedures that the further history of Ramism in Germany has to be traced through its effects rather than its substance.<sup>10</sup>

The Comenian reforms established Ramean dialectic as the proper mode of inquiry throughout Germany. It is important, however, to define Ramean "dialectic" in its proper context. In the operation of Ramean method, the term "dialectic" refers only obliquely to its normal mean-

ing of "reasoning by dialogue." Because of the subsumption of the rhetorical places under logic as the places of invention, any "dialogue" which took place in Ramean logic took place as a process of discovery or invention. One "asked" a place if a concept in fact resided there and was "answered" according to the content of the place. This constant interplay between the object of present experience and its logical locus constituted the "dialogue" of method, and supplied the cognitive bridge between the particular and the general. This process of purely logical dialogue, which clearly implied the existence of a comprehensive frame of reference against which to test all experience.

Hence the dialectic established by Comenius at the core of the German curriculum operated under its own peculiar rules, according to which the goal of inquiry lay in understanding the unity of all knowledge, not merely in amassing facts. Science must seek the dialectical relationships which exist between reality and thought, Comenius argued, through a method "which can state all things of this or any future age, hidden or revealed, in an order inviolable and in fact never broken." This pansophist ideal clearly reached back to those metaphors which lay at the heart of the topical tradition. It looked to the "all-ruling force of order" not as a legislative principle (as in English constructs), nor as a mechanical rule (as in French models), but rather as an actual metaphysical force

operating within nature. "Order is the soul of things," Comenius declared, and dialectic the means of mastery.<sup>11</sup>

"Let us assume," Comenius admonished the members of the Royal Society, "that you have conquered the whole domain of Nature. If you rest content with that...your work will be a Babylon turned upside down, building not towards heaven but towards earth." Science must go beyond facts, he argued, and seek an understanding of that harmony which "really holds together the fabric of this world of ours."<sup>12</sup> Experiment alone could not hope to reveal the workings of nature, since it explored only the particular. Nor could enumeration suffice. Reductive analysis must be followed, not only by synthesis, as for Descartes and Newton, but by *integration*. And only Ramean dialectic, which tied the particular to the general in meaningful patterns congruent to the natural structures of the mind, could provide the tools with which to gain insight into the actual workings of the world.<sup>13</sup>

These dialectical metaphors imposed themselves virtually unmediated on the German intellectual milieu and had a determining impact on German scientific models. In fact, Newtonian theories never gained an official hearing in Germany until 1747 when Frederick the Great brought Maupertuis to Berlin. And it was not until 1775 that Germany turned to any distinctly empirical modes of thought. Moreover, as Klaus Fischer notes, "Locke's first

appearance in Germany...passed largely unnoticed" until as late as 1754 and even then, "whatever his influence was in England or France, it was negligible in Germany. His philosophic impact on [Germany] was always limited by native traditions inimical to his thought."<sup>14</sup> The present argument suggests that at least one of the "native traditions" which militated against the acceptance of the Lockean/Newtonian complex was a strong logical tradition grounded in the topics and systematized by Ramean method.

Likewise, Fischer observes that "French materialism, as expounded by Holbach or LaMettrie, was regarded in Germany with unmitigated horror," explaining this by the hollow fact that "modern science replaced the qualitative medieval ideology of science later in Germany than elsewhere." R. S. Calinger agrees, pointing out that the Cartesians "had little success" in Germany, limited primarily to the Principalities.<sup>15</sup> Calinger's geographic reference is important in the present context. But Calinger does not address the issue in terms of logical models and, in fact, seems to miss the continuity between Ramean and later German constructs. Similarly, Fischer singles out "a backward social environment," "a deep urge of the German mind for order," and "a scholarly community which prized the spirit of thoroughness" as reasons for the rejection of Newtonian models. But in fact, all these amorphous reasons can be stated more concisely and explicitly as clear derivatives

of the logical methodology of Ramus reenforced by the legal metaphors of customary law. Once again, the foregoing suggests that the tardy intrusion of modern science in the German intellectual milieu resulted, at least in part, from the persistence of a topical tradition which rejected the hypothetico-deductive methods of Descartes and the physico-mathematical methods of Newton and depended rather on a methodological paradigm grounded in the "places."

Indeed the survival of Ramean metaphors in the German intellectual tradition had a determining impact on the development of German scientific models. Under the methodological postulates of its logic, German science could pass beyond the empirical data which had embarrassed Newtonian models and could enrich the mechanical constructs of Cartesianism with dynamic principles expressing the structural and organic dimensions of nature. Moreover, the metaphors which controlled its logic invested German science with a characteristic drive toward conceptual completeness which both English and French science lacked.<sup>16</sup> The convergence of this drive with the underlying metaphors of customary law which survived in the educational centers of the South tended to reenforce and validate scientific models which sought to disclose the origins as well as the operation of law. Under the joint impact of the metaphors implicit in Ramean method and the *altes Recht*, 17th Century German science developed as a semantic rather than a

syntactic discipline, committed to the exploration of human experience in all its contextual richness and historical depth.

Gottfried Wilhelm Leibniz, chief architect of German science in the "Age of Newton," drew on these metaphors to develop a scientific model which perfectly demonstrates the differences between the logical substructures of Newtonian, Cartesian and German science. Enlarging on his native logical tradition, Leibniz propounded a theory of inquiry which granted the formal possibilities of thought. But he abandoned traditional subject-predicate relationships in favor of a system of logical order in which all issues of correspondence dissolved into a principle of identity and all categorical hierarchies yielded to harmony as an organizing principle.

Leibniz' ties to the Ramean tradition are clear. An ardent supporter of Comenian pansophism, Leibniz came under the influence of the Herborn Encyclopedists early in his career. Loemker claims that his "reaction to the writings of Alsted, Bisterfeld and Comenius, though never uncritical, was early and enthusiastic." Leibniz' own *New Method of Learning* was clearly influenced by Comenius' *Analytic Didactic* and throughout his career Leibniz defended Comenian doctrines. Although he found Comenius deficient in logic, Leibniz admired his pansophist approach to knowledge and his structural views of nature. An admiring student of

Alsted, Leibniz praised him, along with Keckermann, for "joining method to things," adding that Alsted's *Encyclopedia* represented the summit (*caput*) of knowledge in his time. Leibniz in fact projected a revision of Alsted's *Encyclopedia* in which he proposed to incorporate new scientific advances. Loemker points out that although Leibniz reacted against the excessive dichotomizing indulged in by the Encyclopedists in general, he was "nonetheless affected by their formal method of explicating and analyzing problems through definitions, and inspired by their pansophic labors and ideals."<sup>17</sup>

The most important influence from Herborn came to Leibniz through the works of Johann Bisterfeld, whose *Epitome of the Art of Meditating* inspired Leibniz' own *De Arte Combinatoria*. Loemker notes that Leibniz' marginalia have been preserved in his copy of Bisterfeld's *Epitome* and provide important clues in tracing the genealogy of some of Leibniz' own central logical tenets. Bisterfeld's *Epitome* presented a logic in which concepts replaced terms and propositions as the fundamental units of knowledge. Each concept had a formal aspect which represented the thing known under its primary attributes, and an objective aspect which symbolized the object and assimilated it to the mind. The relations between these aspects constituted the formal structure of the act of knowing. "Logic," Bisterfeld concluded, "is nothing but a mirror of [these] relations."

(To which Leibniz responded marginally, "*Nota bene*"). Inquiry proceeded through a process which Bisterfeld called *immediation* -- an "ineffable and inexplicable penetration of thoughts by which one concept prepares, feeds and augments another...[through] a certain intrinsic conformity or as it were, configuration."

Clearly Bisterfeld drew heavily on the metaphors of the topical tradition. And Leibniz acknowledged his own debt to that tradition through Bisterfeld in the *Arte Combinatoria* where he explicitly required that "everything be derived from the metaphysical doctrine of the relations of being to being. ...I believe that the most sound John Henry Bisterfeld had seen this in his ...*Epitome*...all of which is founded on the universal *immediation*." Leibniz, in fact, carried Bisterfeld's logical *immediation* over into an entire metaphysics in which the doctrines of proportion and relation reappear as a universal harmony. Loemker concludes that "the notes on Bisterfeld thus show Leibniz giving general assent, but often pushing the clarification of his own thought further..until, in the early Hanover years, refined and clarified by mathematical learning, an appreciation of the mechanical order of nature, and a clear theory of perception, they are reformed into his mature monadology."<sup>18</sup>

Following Bisterfeld, Leibniz defined first terms as dialectical concepts comprised of two interdependent properties: *unity*, or identity, and *harmony*, or congruence.



The process of inquiry aimed at unravelling the ontological relationships which pertained between terms considered under both these aspects. It served to establish the underlying patterns of congruence which supported self-identical units as they interacted to generate those phenomena which men perceived as material reality. For Leibniz, in fact, the entire structure of the natural world consisted solely in the relationships which pertained between these terms.

Leibniz argued that to know something absolutely was simply to know its *sufficient reason* for existing -- that is to grasp the essential connections of all its implied predicates (or, as Ramus might have put it, to perceive simultaneously the entire content of its logical locus). He stated the principle of sufficient reason as a law "by which we believe that no fact can be true or real, no statement trustworthy, unless there is a sufficient reason why it should be so and not otherwise."<sup>19</sup> This law personified the contextual metaphors implicit in Ramean logic and customary law. It gave concepts the power to retain in existential fullness all the apparently contingent states which could be predicated of them. Under its rule, the truth of a concept became, in a sense, a function of its origin. By extension, any inquiry into causal principles became an inquiry into history.

By contrast, Newton and Descartes had both deliberately finessed all explanations of origin due to what Leibniz would have seen as the shortcomings of their logic. Newton accepted physical causation as a brute fact of nature induced from the phenomena and referred final causation back to the action of God. Descartes made God himself the logical ground of all causation and thereby avoided issues of correspondence and origin. But Leibniz insisted on a *metaphysical* explanation of cause. He insisted on bridging that gap between physical and final causation which both Newton and Descartes had been willing to leave unbridged.<sup>20</sup>

Leibniz' law of sufficient reason found logical expression in the principle of identity which he developed through an explicit critique of the validity of inference. Passing beyond both the mathematically inferred truths of Newton and the psychologically evident truths of Descartes, Leibniz developed a definition of first premises in which absolute certainty derived from an essential identity of the concept with itself. "First truths are those which make a self-identical statement in themselves," he argued. Leibniz objected to those who "use only incomplete and abstract concepts which thought supports but which nature does not know in their bare form." "In identities," he noted, "the connection and comprehension of the predicate in the subject is in fact expressed; in all remaining propositions, it is merely implicit."<sup>21</sup>

In this dramatic reduction of the order of existence to the order of logic, Leibniz dismissed all inferential knowledge as derivative and all hypothetical deductions as irrelevant to the true nature of things. Co-incidentally he relegated all Newton's inferred laws to the status of second-order propositions and subsumed all Descartes' mechanical constructs under an overarching principle of causation grounded in a notion of origin.

Leibniz' logic in fact moved in a direction contrary to that of both Newton and Descartes.<sup>22</sup> Newton and Descartes had relied on abstractions -- whether inferred or intuited -- in the construction of their laws. But Leibniz' logic moved from the purely conceptual to the absolutely concrete, a drive typical of topical invention. For Leibniz, a complete concept consisted of the sum of its predicates. The more completely specified a subject became, the more real it became. For Newton and Descartes, specificity had implied contingency. But for Leibniz, only completely determined concepts could express a necessary truth. Reaching back to the symbolist ideal which had inspired Scotus, Leibniz claimed that "individuality includes infinity."<sup>23</sup> But this claim in turn reached out to the metaphors controlling Ramean logic. For Ramus, demonstration had meant simply complete definition. Leibniz' portrayal of a self-identical concept as a subject which virtually contained within itself all of its possible

predicates merely presented an intellectualized version of Ramus' description of a logical locus. Of course, substantial differences pertain between Ramean and Leibnizian logic, particularly in their levels of sophistication. But the metaphors which controlled their respective models prove strikingly similar.

Leibniz drew on his principles of identity and sufficient reason to construct a science which replaced the explanatory models of Newton and Descartes with one derived from the Comenian ideal of the structural coherence of the world. Newtonian physics and Cartesian mechanics had each made discrete material particles the ultimate ground of their respective physical and mathematical laws. These discrete particles were irreducible by the standards of inferential or deductive logic and could therefore function as axioms for the construction of laws. But Leibniz' principle of identity would not allow him to accept material particles as the ultimate components of reality. As a logical subject, the concept of matter proved deficient since it did not comprise within itself its primary attributes of extension and motion. Extension, in fact, expressed a derivative notion of the second order logically inferred from our perceptions of the operation of force in nature. Moreover, motion, as conceived by both Newton and Descartes, contained no sufficient reason for its operation in the world.

Newton and Descartes had both been led by the metaphors implicit in their logic to beg questions of ultimate causation. Newton had defined force as a prior concept which, while inexplicable in itself, was responsible for those motions which we perceived in nature. While we could explore the motions, we could never discover the force. Descartes had likewise defined force as only apparent -- a kind of optical illusion derived from the movement of invisible particles. His algebra allowed him to represent motion, but only as an accidental quality derived ultimately from his ontological vision of God. Descartes' static coordinate frame could thus accomodate principles of reciprocal action, but not an actual principle of force. A clear example of the fate of Cartesian dynamics without a mitigating principle of integral force appears in the works of Spinoza.

By contrast Leibniz conceived of force as a logical attribute integral to the notion of substance itself which supplied the sufficient reason for motion. His logical method thus added a dynamic dimension to his analysis of nature which both Newton and Descartes lacked. By challenging the fundamentality of the ideas of extension and motion on the grounds of their logical complexity, Leibniz could subordinate the concept of matter to a simpler, more primitive notion of force. This force, which obtruded into the world as a *vis viva*, constituted the actual

metaphysical source of all extension and all motion.<sup>24</sup> Derived logically through the principle of identity and validated by the law of sufficient reason, this notion of primitive force provided the metaphoric ground for an entire cosmogony in which substance became energy and law expressed potential.

Leibniz expounded the cosmological correlate of his logical notion of force in the *Monadology*, which portrayed the natural world as a vast assemblage of harmoniously related, vitalistically conceived individuals interacting in ways analogous to the laws of mathematical series. But Leibniz' mathematical series differed in important ways from Newtonian and Cartesian constructs. Newton had expressed his theory of fluxions, which was intrinsically algebraic, in classic geometric terms, proceeding by modelling a smoothly continuous curve out of a succession of equal straight-line segments. Thus Newton dealt with the curve as he dealt with nature -- by breaking it down into distinct particles which could then be brought under the laws of geometry.<sup>25</sup> Likewise Descartes, through his differential coordinates, had supplied a matrix within which he could represent all the possible variables along a single pre-determined curve, thereby generating laws of motion. But Descartes' mechanical laws always operated with reference to his static coordinate frame.

Leibniz, on the other hand, developed a mathematical series which could express every point along an infinite number of interrelated curves. By supplying the general equation of a curve in parametric form and varying the appropriate coefficients, Leibniz could thus generate a whole family of curves, each controlled by the "law of the series." This integral model supplied Leibniz with a symbolic language which could portray the actual living progression of curves. And the fundamental differences between it and the more static geometric and algebraic models of Newton and Descartes derived directly from the logical substructures on which they each built.<sup>16</sup>

"Dynamics is to a great extent the foundation of my system," Leibniz admitted, describing his *monads* as the ultimate building blocks of a cosmos in which "all nature is full of life."<sup>17</sup> The monads, in keeping with the principle of identity, expressed complete logical subjects which contained all possible predicates. Under the law of sufficient reason, they were endowed with a primitive *vis viva* that allowed them to develop according to an inner law of change. These perpetually self-unfolding individuals interacted dialectically under a related law of concomitant variation to reflect a universal harmony deduced itself from the law of sufficient reason. In a scientific model completely controlled by the metaphors of his logic, Leibniz thus presented a view of nature which included dimen-

sions of development impossible in the mathematical and mechanical constructs of Newton and Descartes.

In Leibniz' cosmos "every present is great with the future."<sup>28</sup> Every tendential concept and every contingent notion contributed to a larger truth. Everything in process served to complete a larger process. In fact, the whole system of nature rested on a gradual movement toward the realization of an innate potential grounded in the *vis viva*. This model helped prepare the way for a mature evolutionary science and raised theories of probability to a new level of respectability.<sup>29</sup> Indeed it supplied metaphors for the construction of German scientific models which would maintain their force well into the 19th Century.

The principles of identity and sufficient reason became permanent substructures of the German logical tradition through the work of Christian Wolff, an academic whose ubiquitous influence on German thought earned him the title of "The Preceptor of Germany" among critics and champions alike.<sup>30</sup> Born in Moravia and educated at Jena and Leipzig, Wolff came under the early influence of both Comenius and Leibniz, whose logical doctrines he systematized (with important modifications) and established as the foundation of philosophical instruction in German universities in direct contra-distinction to the logical doctrines of both Locke and Descartes.



Wolff's influence on the development of German thought in the 18th Century is undisputed. Although many scholars disagree on the originality and sophistication of his work, all agree on his controlling influence on the German academic milieu for well over a century after his death. Established at the core of the German educational system by what Etienne Gilson refers to as "multifarious, immense and determining manuals," Wolffian logic quickly became an integral part of that Ramean/Comenian educational tradition which Ong described as "the sinews and bones" of German culture. Wolff's disciples "captured most university positions in Germany," Klaus Fischer observes, citing a source which claims that, in 1738, 231 of Germany's top intellectual figures acknowledged Wolff as their preceptor.<sup>31</sup> Gilson marvels at Wolff's "extraordinary influence," while Howell quotes a French contemporary as claiming that "Mr. Wolff is certainly the greatest philosopher that there is in Europe...to be compared to Descartes of France and to Newton of Great Britain."<sup>32</sup> Perpetuated through the derivative logics of Martin Knutzen (1747), G. F. Meier (1752) and Alexander Baumgarten (1761), Wolffian doctrines remained a determining factor in the development of German philosophic and scientific models well into the 19th Century.

It is also significant in the present context to note that, unlike England and France, Germany did not feel the

impact of revolutionary political ideologies until well into the 19th Century. In England, the political and religious "revolutions" actually preceeded the systematic development of its scientific models. In France, revolutionary ideologies imposed themselves on scientific theories already in the making but still sufficiently receptive to accomodate the *philosophes'* conceptions of natural law. In Germany however, where the Revolution did not occur until 1848, scientific models had already assumed their characteristic shape before the underlying metaphors of the *altes Recht* were substantially disturbed. This allowed the logical and legal substructures of German scientific thought to take a stronger hold on its models and to maintain that influence over a longer period of time.

Wolff's logic, drawing on the metaphors of structure and coherence explicit in his Comenian background, continued to insist on identity and congruence as the logical ground of a *nexus rerum* which underwrote the phenomenal world and supplied the structural links which men perceived as regularity in nature. But, in a crucial shift in metaphors, Wolff reversed Leibniz' ontological priorities. Leibniz had subordinated the principle of identity to the law of sufficient reason, expressing it as the logical adjunct of a metaphysical truth. Wolff, by contrast, established the principle of identity as the *source* of the

law of sufficient reason -- a logical inversion made manifest in his strong endorsement of syllogistic as the primary mode of inquiry.

Leibniz' law of sufficient reason clearly contained a-logical elements grounded in theology. Wolff, on the other hand, subordinated these elements to the process of syllogistic, claiming that the link between subject and predicate derived from an ontological connection between essential constituents rather than on a relationship of logical entailment. By insisting on the *ontological* nature of this relationship -- that is by presupposing that subjects objectively "contained" rather than subjectively "entailed" their predicates -- Wolff could claim the syllogism as an actual matrix for representing thought. This clearly reached back to Ramean metaphors in its preference for logical structure over subjective order or purposive law. Wolff claimed that the syllogism articulated the natural logic of the mind itself. It expressed an inherent ordination within the human mind toward the attainment of knowledge. In other words, far from being *commentitia*, syllogistics offered access to the very structures within which all human thought proceeded.<sup>33</sup>

By placing a logical law rather than a metaphysical principle in control of his analytical model, Wolff effectively reduced concrete existence to a mere complement of logical possibility.<sup>34</sup> If existence functioned as the

predicate of a logically identical subject and if all predicates expressed dependent modes of being, then existence itself must constitute a secondary attribute derived from conceptual analysis. Conversely, the existential reality of any conceptual term must depend ultimately on the extent of its logical development. In the context of German pansophism, this ontological stance allowed Wolff to interpret logical metaphors as methodological correlates of the structural coherence of the world. Moreover, by subordinating questions of actual existence to the analytical structures of his logic, Wolff could provide a theoretical justification for hypothetical reasoning grounded in Ramean forms.

Wolff's reformulated ontology generated a characteristic scientific model controlled by a metalogical notion of contingency -- *contingentia mundi*. Since the principle of identity took precedence over the law of sufficient reason in Wolff's logic, potential necessarily preceded existence in his science. Since Wolff defined "being" in terms of "possibility" -- *quod possibile est, ens est* -- he consequently defined inquiry as an investigation of the possible, not an analysis of the extant -- *scientia possibilium, quatenus esse possunt*.<sup>35</sup> Under the postulates of Wolff's logic, inquiry into the natural world thus became a hypothetical investigation into the *complementum possibilitatis* of any given phenomenon.<sup>36</sup> Hypotheses

could function in inquiry as "substitute reasons" which when tested brought the mind closer to the genuine sufficient reasons for the underlying structures of nature. They could supply the data for an *ars inveniendi* which investigated the natural world through a set of heuristic techniques grounded in syllogistic, but capable by extension of reaching outside the confines of strict deductivism in the pursuit of new knowledge.<sup>37</sup>

It is important, however, not to confuse Wolff's doctrine of possibility with the traditional doctrine of Aristotle which stipulated possibility as a complement of existence. Wolff, through his inversion of Leibniz' ontology, clearly rejected the classical scheme of possibility which defined actualization as a causal effect of metaphysical tendencies. By contrast, Wolff opted characteristically for a purely logical explanation. "In Wolff's view," Van Peursen points out, "actual existence is the outcome and part of possible existence, or, in Wolff's terminology, part of 'ens', being, inclusive of all logical possibilities."<sup>38</sup> In an apparently inadvertent use of language, Van Peursen goes on to make a comment of particular interest in the present context. He describes Wolff's concept of being "as a kind of logical space" which contains notions corresponding to possibilities. He even points out that Wolff himself used the term *receptaculum* to describe general notions. But Van Peursen never ties these images

to the logic of the places. In fact, he misapplies his own image to the extent of claiming that Wolff's logic "gives profile to the line of Bacon [and] Descartes." Clearly Van Peursen has recognized the operation of topical metaphors here without perceiving their provenance or understanding their importance in underwriting the conceptual continuity of German thought.

In fact Wolff's endorsement of hypothesis underwrote crucial differences between his scientific model and those of Newton and Descartes.<sup>39</sup> Newtonians had treated hypotheses as second order propositions capable only of testing impermeable facts. Cartesians had used them as speculative explanations of mechanical events. But Wolff, like Ramus, employed hypotheses as actual working premises in chains of composite reasoning designed to penetrate the order and structure of nature.<sup>40</sup> The principle of identity stipulated that any given phenomenon could logically have come to exist in an infinite variety of ways. But logical possibility alone could not provide sufficient reason for a concrete thing to exist. Each actual phenomenon in fact came about through a specific, though not necessary, series of events. The determination, or cause, of any physical state therefore carried no logical necessity, only a physical dependence on preceding states. In Wolffian terms, physical phenomena, as opposed

to logical concepts, had their sufficient reasons outside themselves.<sup>41</sup>

Wolff therefore insisted that the investigation of physical phenomena must proceed through hypothetical inquiries into the chain of concrete events which actually led to the realization of one, rather than another, of the complement of possibilities. The scientific investigation of a discrete fact must work to determine its "place" within a series of empirically verifiable events. This could be achieved only through a sequence of inquiries each of which built upon the outcome of the last. In short, Wolff's logical metaphors rendered experiment the methodological correlate of hypothesis.

Indeed, Wolff's entire scientific model rested on metaphors of integration and mutual dependence which clearly derived from the theories of men like Bisterfeld and Comenius as they worked to accommodate Ramean theories to the logic of Melancthon. By contrast, Newton and Descartes tended to rely on the investigation of the proximate cause of an event as revealed by specific experiments designed to isolate phenomena from their contextual base. Wolff appealed rather to contextual metaphors. He explained cause as a process through which each experienced phenomenon simply constituted the sufficient reason for the next in an endless series of interrelated events. Wolff's sequential explanation of cause clearly illustrates the

direct operation of logical metaphors on his scientific model. Where reductive analysis and enumeration had generated an atomic view of phenomena, the process of logical integration generated a contextual, even an historical, view.

The topical metaphors which controlled Wolff's logic become particularly significant when considered in comparison to Bacon's rejection of the "Idols" or Descartes' "escape from perspective." Consider, for example, Wolff's characteristic reformulation of Descartes' *cogito*:

"Whatever being is actually conscious of itself and of other things outside itself, that being exists. But we are actually conscious of ourselves and of other things outside ourselves. Therefore we exist."<sup>42</sup> The crucial addition of external reality to the determination of first premises and the significant introduction of the first person plural to the proposition clearly articulates the fundamental differences between the metaphors operative in Cartesian and Wolffian logic. Wolff's entire analysis in fact proceeded under the assumption that a community of consciousness existed as the ground of inquiry and that the act of predication itself expressed consensual knowledge. Moreover, the foregoing argument suggests that this predisposition to subordinate the singular to the plural derived, not only from Ramean logical metaphors, but also from the legal metaphors which supported medieval functional theories of



society and customary law in the urban enclaves of Southern Germany.

The characteristic ability of Wolff's logic to portray any concept as a mediate term in an endless series -- an ability which derived directly from his reliance on topical metaphors -- gave his science the correlative ability to view empirical facts as discrete stages within a coherent sequence of related phenomena. Facts had histories which functioned as their cause. Moreover, they had a future controlled, but not dictated, by an actual principle of development operative within the limits of the series. But Wolff's principle of development invoked no divine plan, as Leibniz' had. It merely expressed the sequential transformations which occurred within the logical structure of a given event as it subsisted at various stages within the series.<sup>43</sup> This ontologically independent conception of development, when applied to the natural world, produced a powerful new notion of law grounded in the historical and structural reality of phenomena themselves. When combined with Wolff's methodological endorsement of hypothesis and experiment, this morphotic principle of order generated a distinctive set of metaphors which would dominate German scientific theory for the next hundred years.

The metaphors of structural change implicit in Wolffian doctrines emerged in German science as *Naturphilosophie*. This cosmological model presented the natural world as an

organic structure possessed of an inherent logic which directed its phenomena and determined its effects. In contrast to English science, which concerned itself primarily with physico-mathematical constructs, or French science, which concerned itself with physico-mechanical functions, 18th Century German science evidenced a characteristic preoccupation with morphological studies focused on the origin and transformation of phenomena. The *Naturphilosophen* were committed to exploring nature in all its logical complexity and historical depth. They proposed a systematic investigation of the correlations between structure and function which underwrote the perceived regularities of things. In short, they proposed a programmatic application of Wolffian logical metaphors to the disciplines of natural science.<sup>44</sup>

German morphologists sought an understanding of the functions of nature through an understanding of its structures. Thus Jacob Fries developed a theory of organic instinct grounded in the laws of crystalline structure which he defended against Descartes' mechanical laws of equilibrium. Fries contended that the laws of crystallization in fact displayed the universal morphotic principle behind organic growth. By contrast, Descartes had argued that organic forms derived from particles of matter in motion achieving a state of equilibrium -- a theory which clearly reflected his mechanical model. But Fries'

attempt to reduce organic to crystalline processes clearly manifested the drive in Wolff's methodology to subordinate existential events to logical structures. Fries played a central role in the founding of modern cytology as the mentor of Matthias Schleiden, who extended the search for a theory of free crystallization to a study of the pathology and life history of cells. His related attempts to explain self-maintaining organic processes according to the circuit laws of the voltaic cell made him influential in subsequent studies of polarity, magnetism and galvanism. Fries was a Moravian educated according to Comenian principles by the United Brethren at Herrnhut. Moreover, he was a disciple of the Moravian Karl Reinhold, an avowed Ramist.

Inspired by Fries, Karl Ernst von Baer applied the principles of *Naturphilosophie* to anatomy in a study of vertebrate morphogenesis which rested entirely on his ability to envisage the organism as an historical entity. Baer's theories led to a unifying theory of embryology. His discovery in 1826 of an egg in a mammalian ovary ended a search begun in the 17th Century and pursued by such lights as Gabriel Harvey. In contrast to the theories of the French naturalists, Baer developed an epigenetic theory which stipulated that development occurred from the general to the special -- a theory clearly grounded in the Wolffian principle of identity.

This characteristic theory of development allowed German anatomists later in the Century to reject the recapitulation doctrine central to Darwin's theory of evolution. In a striking expression of a closed categorical model, Darwinians argued that "ontogeny recapitulates phylogeny." As a result, they were unable to provide a logical bridge from invertebrate to vertebrate species. By contrast, the German dialectical model allowed for a principle of development grounded in logical, not existential, structure. This left the structures of nature open to contingent effects which had no status in Newtonian or Cartesian paradigms. Baer's epigenetic theories rendered German evolutionary science more flexible and more open to the fruits of experimental research. Further developed by Haeckel and Gegenbauer later in the Century, this structural approach to evolution eventually issued in a theory of "caenogenesis" which could account for new evolutionary acquisitions, effectively negating the recapitulation theory. In fact, as evolutionary theories matured throughout the 19th and into the 20th Century, they tended to follow the German rather than the Darwinian model.

Baer's theories, in turn, led to studies in metabolism which eventually replaced the mechanistically conceived "combustion" theory of the Cartesians with a structural model portraying the living organism as a dialectical unit engaged in a constant exchange between its own constituent

parts. Carl von Voit established an influential school of metabolic studies at Munich. His theories grew out of Liebig's "metamorphosis" theory of animal chemistry which stated the laws of animal nutrition as transformational principles. Again, the evidence of Wolffian metaphors is clear. And again, it is interesting to note that Voit was a Bavarian and educated at Göttingen, a center of Ramist activity in the crucial period following Ramus' death. Another pioneer in morphological studies, Albrecht von Haller, also taught and pursued research at Göttingen. Haller demonstrated, through experiments in capillary action, that the laws of hydraulics could not, in fact, be applied to the functions of living organisms as the Cartesians had claimed they could.<sup>45</sup>

Meanwhile, at Jena, Carl Gegenbauer developed Baer's morphogenetic theories into a new science of comparative anatomy, arguing that reductive analysis was methodologically incapable of exhibiting the underlying structural relationships that pertained among organisms. Indeed Gegenbauer's defense of comparison as a methodological tool is particularly significant in the context of Wolffian and Ramean logic. Gegenbauer insisted on comparison as the basis of all phylogenetic reconstruction. Given the formal and temporal priority of the cell, he argued, the only way to establish the morphological relationships which existed between organs, organ systems or entire organisms was

simply to experimentally determine and then compare their respective structures and development. Structural analysis within an historical context provided the foundation of this scientific model, just as they had in Wolff's logical model.<sup>46</sup>

To meet the demands of these emerging disciplines, which necessarily pursued their inquiries at the cellular level, an entire science of microscopy developed at Bonn under the direction of Max Schultze and Ernst Brücke. Indeed the bare conception of microscopic analysis fits more comfortably within a logical model determined by Wolffian rather than by Newtonian or Cartesian metaphors. Newton portrayed the ultimate components of his science as abstract mathematical points hardly receptive to structural analysis at any level. Likewise, the material components of Descartes represented impermeable atoms irreducible by logic, much less by analytical instruments. But Wolff conceived his elements as actual physical constructs whose very existence implied a structure derived from the specific determination of a spectrum of possibilities. Such an ontology could easily accommodate the notion of structural analysis carried on at a level which subtended normal perception.

With microscopy supplying the analytical tools and comparative research in zoology, botany and anatomy supplying invaluable experimental data, German science developed an

independent discipline of experimental medicine characterized by clinical observation, physical diagnostics and cellular pathology. Pioneering in the use of experimental laboratories and morphological techniques, both of which drew on the metaphors central to Wolffian logic, German medicine attained an ascendancy in Europe that would not be challenged until well into the 20th Century. In the present context, it is significant that all these emerging disciplines developed in Universities which fell within the geographic sphere dominated by the *altes Recht*: metabolic studies at Munich; vertebrate morphology and comparative anatomy at Jena; plant pathology at Leipzig and Halle; cellular pathology and experimental medicine at Würzburg; embryology at Königsberg; microscopy at Bonn. The arguments developed above suggest that these geographic congruences are not accidental, but rather co-incidental with the dominance of powerful legal and logical metaphors deeply embedded in the intellectual traditions of South Germany.

Likewise in the fields of psychology and epistemology the principles and methods of Wolffian logic, grounded in Ramean and Comenian metaphors, underwrote the development of a theoretical model which issued eventually in the establishment of experimental psychology as an independent discipline. German psychological theories developed out of one of the primary assumptions of Wolffian logic -- that

modal linkages, rather than occult forces or substantive communication, underwrote the processes of perception. This became, in psychological terms, the theory of psychophysical parallelism. English psychology, in keeping with its inferential logic, attempted to explain perception through "occult" forces directly analogous to those of Newtonian physics. Cartesian analysis generated a psychology which exhausted the meaning of consciousness in its logical function and explained perception through mechanical causes directly analogous to those operative in the material world. By contrast German psychology, building on metaphors of identity and congruence, developed a model in which structural relationships conditioned the process of perception.

Johann Friedrich Herbart developed a theory of perception which, in an explicit use of Ramean images, described consciousness as an "apperceptive mass" which functioned through its ability to "glue" together simple concepts to form complex ideas. In a direct application of Comenian ideals, Herbart also established the first experimental program in pedagogy at Königsberg where he tested his purely Wolffian theory that education proceeded through morphological changes within the individual. Herbart drew explicitly on spatial analogies and principles of structure in developing his theories of relative intensities and



sensory thresholds to explain the physical processes involved in perception.

Furthermore, the images which lie at the base of Herbart's theories prove to be curiously persistent throughout the German psychological tradition. German psychological theories in fact encouraged the use of spatial analogies and metaphors of local motion drawn directly from the Ramean tradition. Consider Gustav Fechner's treatment of psychology as an exact science of functional relations and Ernst Weber's reduction of those relations to an integrated system of arithmetical and geometrical series. Consider Hermann Lotze's theory of perception as a system of local signs governed by a network of structural relationships. Consider Wilhelm Wundt's arguments for the localization of function based in a structural definition of consciousness and Karl Ewald Hering's development of an actual diagrammatic matrix for the spatial ordering of sensations. Above all, consider the structural metaphors and spatial analogies controlling the theories of Gestalt psychology which described perception as a holistic grasp of generic structural features.

Moreover the foregoing analysis suggests that the Ramean images and analogies which lie at the base of the German psycho-physical tradition were reenforced by those legal metaphors characteristic of customary law. This premise becomes even more tantalizing in the light of a few

geographic facts. Herbart pursued his researches at Königsberg, Jena and Göttingen. Weber and Fechner established their theories at Leipzig and Halle, where Lotze studied before succeeding Herbart at Göttingen. Wundt, educated at Heidelberg and Tübingen, spent his career at Heidelberg, Leipzig and Zurich. Hering, educated at Leipzig under Wundt, carried on his research there and at Vienna and Prague. Brentano, educated at Würzburg, pursued his career there and at Vienna. Just as with the physiological disciplines, developed out of Wolff's morphological metaphors, the psychological disciplines, grounded in his principles of structure and identity, seem to be centered in precisely that region controlled by Comenian ideals and the *altes Recht*.

Even in the traditionally analytical field of physics, German science maintained a philosophical commitment to the logical metaphors which shaped its theories. Helmholtz, who declared himself in open reaction to the principles of *Naturphilosophie*, drew nonetheless on the metaphors implicit in its tradition. His interest in force conversion, which resulted in the development of the laws of thermo- and electrodynamics, derived principally from earlier researches in optics and acoustics -- researches grounded in visual localization and a structural theory of resonance. Likewise his reduction of body movement to chemical forces built on the metabolic theories of Voit and

other morphologists. Indeed, Helmholtz was characteristically dependent throughout his career on spatial analogies. He viewed force and intensity as functions of *position*, rather than velocity, basing his entire argument on the claim that, if all matter is in fact dispersed into its ultimate components, the only way to conceive of motion is to conceive of the change in relationships as spatial. Again, it is interesting to note that Helmholtz was educated by leading morphologists and pursued his scientific career at Königsberg, Bonn and Heidelberg.

Thus it seems evident that the respective careers of Aristotelean, Cartesian and Ramean logic did indeed have a significant impact on emerging European scientific models. The centrality of logic to the scholastic curriculum, still in substantial control of all European universities in the 17th Century, ensured that the principles and methods of the logic taught in the respective Schools would be a controlling factor in the construction of theoretical models. Moreover the distinct political environments in which these models arose also exerted a determining influence by supplying characteristic sets of legal metaphors to scientists reaching out for new conceptions of physical law. In England, Neo-Aristotelian constructs interacted with domestic legislative paradigms to produce an inferential logic and an empiricist science. In France, Cartesian principles interacted with a native centralized absolutism

to produce a hypothetico-deductive logic and a mechanist science. In Germany, Ramean models interacted with a native Rhenish humanism and an urban tradition grounded in the *altes Recht* to produce a dialectical logic and an experimental science.

Each of these logical and scientific models would in turn have an impact on the American intellectual tradition, unique by virtue of being an amalgam of all three. The following chapters will assess the relative impact which these metaphors of physical law and logical order had on American thought and examine the ways in which they prepared it to cope in the 19th Century with a revolutionary new scientific model which would, in turn, demand metaphors adequate to its theory.

CHAPTER NOTES

1. Ong, Ramus, 164, 298, 304.
2. Kelley, Ideology, 154.
3. For a discussion of these Rhenish humanists and their influence see Ong, Ramus, 232-240.
4. Ong insists that "the role of the Wéchel printing firm should not be minimized," noting that "Agricolan dialectic had never really flourished in Germany until the Wéchels took it back there from Paris in 1572, reprocessed by Paris scholasticism (Ramus, 307-318). Ong ties these observations to his wider argument concerning the effects of the printing industry in general on the transition from an oral to a visual culture.
5. Ong, Ramus, 298, 5; Romance, 168.
6. Miller, Mind, 498.
7. Ozment, Reformation Europe, 362-368.
8. Other influential figures among The Mixts included Kaspar Olevian and Matthew Martini, founders of the covenant theology; John Althusius, political philosopher; John Henry Alsted, encyclopedist par excellence; John Bisterfeld, educational reformer; and Johann Comenius. For a discussion of the historical significance of the Herborn School see Ong's chapter "The Diffusion of Ramism" in Ramus and Perry Miller's chapter "The Literature of Ramus' Logic in Europe" in Mind. See also Howell's chapter "Systematics and Neo-Ciceronians" in Logic and Leroy E. Loemker, "Leibnitz and the Herborn Encyclopedists," Journal of the History of Ideas 22 (1961):323-338.
9. Ong, Ramus, 10.
10. J. E. Sadler, J. A. Comenius and the Concept of Universal Education (New York, 1966), 107. Comenius travelled as far as England in his lifelong campaign for educational reform. Received by the Royal Society in 1641 in London, he wrote one of the central documents of his pansophist program while in England. But although well received there, his influence on English education and thought proved minimal since his visit was cut short by the outbreak of the Civil War. For a discussion of Comenius' activities and influence in England see B. R. Bradbrook "Comenius in England" in Comenius (New York, 1972), 15-31. See also Matthew Spinka, John Amos Comenius: That

Incomparable Moravian (Chicago, 1943).

11. S. J. Velinsky, Comenius, 151, 154.
12. Sadler, J.A. Comenius, 72, 190.
13. For Comenius on education see Sadler, J.A. Comenius, 187-207 and Vera Stárková, Comenius, 100-103.
14. Klaus Fischer, "John Locke and the German Enlightenment: An Interpretation," Journal of the History of Ideas 36 (1975):431-446.
15. R. S. Calinger, "The Newtonian-Wolffian Controversy: (1740-1759)," Journal of the History of Ideas 30 (1969):320.
16. Ault argues that "the lure of dialectic seems to be toward comprehensiveness, completeness, and totality of a sort that is bound up with creative processes. ...Dialectic is therefore characteristic of a lure toward what Whitehead calls "causal efficacy", while [analytical] logic is the conceptual form of the lure toward 'presentational immediacy'." Ault extends this argument to a discussion of an apparent tension in perception "between the desire to grasp the object in its completeness (which requires time) and in its definiteness (which defies time)" and concludes ultimately that the dialectical process necessarily implies a dimension of development or history (Blake, 175-176).
17. Loemker, "Leibniz...", 332-334.
18. Loemker, "Leibniz...", 337.
19. See Monadology, sec. 31 and 32.
20. For a discussion of the operation of the law of sufficient reason see S. H. Mellone, The Dawn of Modern Thought (London, 1930), 87-117. See also Hall, Philosophers at War: The Quarrel Between Newton and Leibniz (Cambridge, 1950), 157-158.
21. Leibniz, First Truths, From Descartes to Kant, trans. Smith and Greene (Chicago, 1840), 340-346.
22. Gilson calls it "an inverted materialism" (Modern Philosophy, 158).
23. Langston points out that Leibniz' principle of identity bore a close resemblance to Scotus' definition of the adequacy of a concept and argues for "Leibniz' virtually wholesale agreement with Scotus" (God's Willing Knowledge, 121-123).

24. Philosophical Papers and Letters: A Selection, ed. L. E. Loemker (Chicago, 1956), 861. The *vis viva*, expressed mathematically by the equation  $mv^2$ , manifested itself as an unlimited number of latent possibilities which always tended to realize themselves. Not to be construed as "mere potentiality" in the Thomist sense, it represented an active inward tendency which could generate motion without any external stimulus.

25. Newton, Principia, 29-39. Ault describes Newton's fluxions as fundamentally geometric, and thereby static, representations which "bring mathematics into the realm of process and at the same time transfer the activity of process to the static realm of mathematics" (Blake, 120).

26. For a discussion of Leibniz integral law of the series as it relates to logical issues, see W. P. Carvin, "Leibniz on Motion and Creation," Journal of the History of Ideas 33 (1972):425-438; Hall, Philosophers, 62.

27. Leibniz, The Principles of Nature and of Grace in From Descartes to Kant ed. Smith and Green, 360.

28. Leibniz, Philosophical Papers, ed Loemker, 869.

29. Mellone points out that Leibniz "prepared the way for a doctrine of evolution in his view of the substantial similarity of all things" and still more in his view of a perfect gradation of existence. But he warns that "Leibniz appears to attach little importance to the development of the world in successive stages; and he has no conception of a cosmic evolution in which the lower stages are antecedents and conditions of the higher" (Dawn, 107-108). In keeping with his principle of identity, Leibniz rather endorsed a doctrine of "embôitement" according to which, for example, the chick exists as a whole in the egg before incubation. A simple expansion or unfolding of the organs constituted its development. This doctrine became extremely popular in the 17th Century, although it was severely (and predictably, according to this argument) criticized by Harvey.

30. Wolff's logic is presented primarily in his Philosophia Rationalis sive Logica (1728). For English translation see R. J. Blackwell, Preliminary Discourse on Philosophy in General (New York, 1963). It is sometimes difficult to grasp the importance of Wolff's thought in shaping subsequent paradigms because of the ambiguous treatment which he has received at the hands of scholars. Assessments of Wolff's logic range from those which assign him no originality whatsoever (see Bertrand Russell, History of Western Philosophy (New York, 1946); Basil Willey,

The Eighteenth Century Background (New York, 1940); Etienne Gilson, Modern Philosophy: Descartes to Kant (New York, 1963); Peter Gay, The Enlightenment: An Interpretation (New York, 1973), to those who view his doctrines as independent and recognize in them the seeds of everything from Marxism to Swedenborgian mysticism (Frederick Coppleston, History of Philosophy (New York, 1960), vol. 6; Paul Hazard, European Mind (New Haven, 1953); Tore Frangsmyr, "Christian Wolff's Mathematical Method," Journal of the History of Ideas 36 (1975):653-668; Winfried Lenders, "The Analytical Logic of G. W. Leibniz and Christian Wolff: A Problem in Kant Research," Synthese 23 (1971):147-153). For a balanced view of the originality and influence of Wolff, particularly in relation to Leibniz' thought see Charles A. Corr, "Christian Wolff and Leibniz," Journal of the History of Ideas 36 (1975):241-262.

31. Fischer, "John Locke..., 432.

32. Gilson, Modern Philosophy, 173; Howell, 18th Century, 364. Peter Gay concludes that "in his lifetime, [Wolff's] popularity was immense and his influence incalculable" (Enlightenment, 328), while R. S. Calinger claims that Wolff "provided the German world with its new school of philosophy -- Germany's first national product in philosophy" ("Controversy...", 321). Paul Hazard goes even farther: "They called him The Sage," he writes, "the name of philosopher not being good enough for him. Whole nations admired him" (European Thought, 40). Frederick Coppleston describes Wolff as a kind of philosophical teacher to his entire nation and claims he single handedly created a school philosophy for German universities whose effects long outlived their author (History, vol.6.1, 135).

33. Although Wolff explicitly rejected topical *organization* as a dialectical tool, he relied implicitly on its metaphoric elements of structure and depth in formulating his defense of syllogistic (see *Philosophia Rationalis*, sec. 50, 332). For a discussion of Wolff on logical entailment see Lenders, "Analytical Logic...", 148, 150-151. For Wolff on the principle of identity and the law of sufficient reason see *Ontologia*, sec. 27-78. For a discussion of Wolff on method see Charles Corr, "Christian Wolff's Treatment of Scientific Discovery," Journal of the History of Philosophy 10 (1972):323-334.

34. *Ontologia*, sec. 174.

35. Ibid., sec. 135; *Philosophia rationalis*, sec. 29, 94-102.

36. See *Philosophia Rationalis*, sec. 21-25, 107, 112, 125-129.



37. See *Philosophia rationalis*, sec. 74. Corr presents a discussion of one particular aspect of Wolff's *ars inveniendi* which is of particular interest with regard to later discussions of Peirce's logic. "This art involves...a theory of signs and their use in denoting things or ideas, together with a theory of the interrelations between these signs. More broadly, for Wolff the constitution of signs rests on a theory of symbolic knowledge and a universal language, as well as an ontology. It is expressed in the construction of an artificial language, or in an inventory of the resources of an existing symbolic system such as the one Wolff provided in his *Mathematical lexicon* of 1716. Lexicons and notational systems, however, become relevant to scientific investigators only when merged with a kind of calculus which explains their use. In this case Wolff's goal would be a truly *a priori ars inveniendi* wherein an analysis of the sign system itself and a computation within its framework would lead to truths not previously known" ("Scientific Discovery...", 333). But, as Corr goes on to point out, this is not within Wolff's intellectual reach in the 18th Century. He therefore restricts the operation of the *ars inveniendi* to the critical instance of scientific discovery, which is where Peirce found it lodged a century later.

38. Van Peursen, "Christian Wolff's Philosophy of Contingent Reality," Journal of the History of Philosophy 25 (1987):69-82.

39. It also generated a cosmogony which differed from that of Leibniz in important ways. Leibniz, despite heroic attempts to the contrary, was ultimately forced to accept a fundamentally determined view of the natural world as a logical consequence of his doctrine of the *vis viva*. But Wolff had subordinated Leibniz' metaphysical cause to the structures of his logic. This led to an explicit rejection of the monads in favor of a theory of simple substances described by Wolff as "atoms of nature" (*Cosmologia*, sec. 186). Unlike Leibniz' monads, these indivisible physical points possessed an actual physical force by virtue of which they could interact both physically and dialectically. Corr points out that where Leibniz' monads tended to panpsychism and idealism, Wolff's "atoms" are more physical and realistic (Corr, "Wolff and Leibniz," 256). Kenneth Schmitz agrees, noting that Wolff's logic "served to give an impressive formation to the philosophy of object...as a safeguard against subjectivism" ("Metaphysical Restoration...", 255).

40. It was precisely Wolff's reliance on the metaphors of the Philippo-Ramist tradition which allowed him to claim that his logic provided theoretical justification for hypothetical reasoning. Wolff, like Ramus, could view

hypotheses as tentative forays into a conceptual order which underwrote the process of inquiry itself. Hypotheses provided data which, through testing, guided the mind in the discovery of those patterns which revealed the actual structure of the world. Lenders, in an apparently inadvertent use of terms, characterizes this aspect of Wolff's logic as "a highly pragmatic position" ("Analytic Logic...", 148), while Corr points out that this "most decisive break with the Cartesian tradition" helped to establish Wolff's logic "as a practical instrument for human reasoning" ("Scientific Discovery...", 334).

41. This, in fact, is the way in which Wolff defines contingency (see *Ontologia*, sec. 310, 312, 318).

42. Wolff, *Psychologia empirica*, sec. 16.

43. For a discussion of Wolff's notion of the series in relation to Leibniz' "law of the series" see Tore Frangsmyr, "Christian Wolff's Mathematical Method and Its Impact on the Eighteenth Century," *Journal of the History of Ideas* 36 (1975):653-668.

44. Significantly, the first major break with the tradition of the *Naturphilosophen* occurred at precisely that point in time when revolutionary ideologies began to take hold in Germany, disturbing the hegemony of the *altes recht*. Styled appropriately, the "1847 School" this group, under Karl Ludvig, rejected the operation of an innate principle of energy in nature and attempted rather to describe all physiological phenomena according to the techniques of physics and chemistry. The result was a decidedly mechanistic model not unlike that of the Cartesians.

45. For a fascinating discussion of some of the philosophical foundations and consequences of metabolic theory see Hans Jonas, *Philosophical Essays* (Englewood Cliffs, 1974), 206-224.

46. Gegenbauer was, in fact, responsible for the establishment of the first regular Chair in Comparative Anatomy at Jena in 1858.

Chapter 6

RAMUS IN THE NEW WORLD:

Logical Metaphors

in

A Colonial Environment

Investigations of the metaphors underlying the construction of physical law and logical order hold a special relevance for discussions of American intellectual history. Concepts of law and order took on a compelling urgency for colonists clinging to the edge of a remote wilderness. In the New World the demand for prescriptive law and a viable order expressed neither an abstract philosophical quest nor an innate conceptual drive. Here it expressed an existential need which ranked second only to the more immediate concern for food and shelter. In a frontier environment the menace of disorder threatened more than the conceptual coherence of the colonial endeavor -- it threatened its actual survival. The early colonists desperately needed the protections of law and the assurance of order to succeed in establishing a foothold in the New World.

But the conditions of settlement themselves isolated these fledgling communities from traditional models of law and order which might have served to underwrite their

polity. Moreover, this isolation took place at a crucial juncture in the development of Western Thought -- at precisely that point in time when European conceptions of physical law and logical order underwent significant revision. Colonists in the New World thus found themselves doubly isolated -- both from consoling contact with traditional models and from that invigorating interplay between competing logical systems which effectively restructured thought throughout 17th Century Europe.<sup>1</sup> This double isolation forced the early colonists into a defensive posture. Far removed from familiar patterns of authority yet faced with the necessity of maintaining order in a hostile environment, they fell back on that logical model which offered the greatest degree of control. They then proceeded to adapt that model to the organization of colonial perceptions and the management of colonial experience.

It lies beyond the scope of this study to examine and evaluate the myriad forces which helped to reshape the European intellectual heritage in its American image. That task has been ably undertaken by an endless stream of scholars intent on identifying tangible processes of cause and effect in the construction of an American ideology.<sup>2</sup> The present chapter will restrict itself rather to the more basic task of uncovering and articulating the conceptions of physical law and logical order developed by Colonial Americans in their attempt to deal with wilderness experi-

ences. According to the current argument, the delineation of this logical substructure should provide valuable insights into the formulation of legal and scientific models peculiar to the American intellectual milieu.

The initial and most potent influence on the development of colonial thought came undeniably from English sources. But the radically different historical and social contexts from which English conceptions of order derived guaranteed that they would not impose themselves unmediated on colonial life. Moreover, it remains an essential fact of the colonial search for order that this search went on in the wider context of general political and intellectual disorder at home. The stresses placed on English legal models by the Commonwealth, the Restoration and the Glorious Revolution combined with the inadequacies revealed in English logical models by the developing physical sciences tended to lessen the impact which these would have on developing colonial constructs.<sup>3</sup>

This proved particularly true of the forms of Puritan polity which emerged in the northern colonies.<sup>4</sup> Here the crisis of legitimacy endemic to any transplanted community became excruciating due to the peculiar circumstances of establishment and growth. The settlers of Massachusetts Bay arrived in America armed with a holy mission to establish a new Zion. Their faith underwrote that mission and guaranteed its legitimacy. "The Lord hath given us leave

to drawe our owne Articles," Winthrop declared.<sup>5</sup> But the secular legal foundations of Puritan polity proved less clear. In fact the architects of the Citty held a clouded title to that Promised Land upon which they built. Although their patent derived ultimately from the Crown, the Royal prerogative extended only as far as those specific purposes set forth in the document of incorporation. De facto authority rested within the community itself and emanated entirely from the agreement of its members.<sup>6</sup> Moreover, by remaining in actual possession of the instrument of power upon which their community was founded -- that is, by bringing their Charter with them to the New World -- the colonists of Massachusetts Bay cast a second shadow over the legitimacy of Royal authority, subordinating it not only to God but to the General Court.

The chartered company, while a useful instrument for economic organization and control in England, proved a hopelessly inadequate source of order under the vastly different conditions of New World settlement. Designed to administer a limited commercial enterprise within an established political regime, the corporation functioned well within the confines of European order. But in colonial America, the charters represented the *only* order. Their authority extended by default to the administration of all civil relationships. In actual operation, the everyday administration of colonial affairs reverted to local

authorities who, in turn, justified their power under the terms of the charter. But the charters offered no logical justification for the de facto order, only a hazy appeal to the "rights of Englishmen" which, although supported and defined by centuries of common law at home, proved tenuous at best under wilderness conditions.<sup>7</sup>

Yet the confusion of the political and religious errands upon which the settlers of Massachusetts Bay embarked ensured that they would seek a logical justification for their polity. If the salvific experiment were to succeed, it had to conform not only to the pragmatic demands of the frontier, but to that model of Eternal Truth revealed in the Scriptures and expounded through logic. And the religious confession of the Fathers determined in advance that the logic upon which they would draw to justify their errand would be that of Peter Ramus. Miller, Morison, Ong and Howell have made it essentially superfluous to argue for the congruences between Ramean logic and the "New England Way." Their works provide a clear genealogy for New England Ramism, transmitted through the curricula of colonial colleges and, subsequently, through a system of public education administered by a profession trained up in its principles. Logic, Morison tells us, remained "the basic subject in the curriculum...and the most esteemed writer on this subject was Peter Ramus."<sup>8</sup> Perry Miller claims that the transmission of Ramean

theories to New England is "clearly traceable," pointing out that "almost all the principle works of Ramus appear in the New England lists."<sup>9</sup>

Moreover, Aristotelean paradigms lent support to Popery, while Cartesian logic came too late to the New World to contribute to the construction of its models. Cartesian logic first entered Harvard in 1689, under the administration of William Brattle. But Brattle's ostensibly Cartesian *Compendium* did not discard Ramean principles. It merely translated them into Cartesian images, thereby giving them a new life and force. As late as 1719, Miller points out, logic in New England "continued to be closer to Ramus" and remained essentially unchanged. Indeed the first serious threat to Ramean logic did not appear until well into the 18th Century when the logic of Locke, not Descartes, began to make inroads on the Colonial consciousness.<sup>10</sup> Throughout the formative Colonial period, in fact, the logic of "that Great Scholar and Blessed Martyr, Peter Ramus,"<sup>11</sup> which subordinated all questions of priority and legitimacy to the ordering role of the places, provided logical justification for the emerging Puritan order.

Indeed "the fundamental fact concerning the intellectual life of New England," Miller contends, "is that they ranged themselves definitely under the banner of the Ramists."<sup>12</sup> In the New Canaan of Massachusetts Bay,



Ramean logic found its spiritual home. Here, in the splendid isolation of a colonial frontier, its methodizing techniques could extend themselves not only across a curriculum but across the entire spectrum of practical, intellectual and spiritual life. Moreover, the "baptismal efficacy of the ocean-crossing" cleansed New England Ramism of the disproportionate rhetorical focus which had contaminated its English counterpart and allowed the purely logical components of Ramism to reach out in all their naïve simplicity across a physical and intellectual environment which cried out for controlling principles of order.<sup>13</sup> Ramism, Miller claims, provided the colonial mind with a framework which survived "without serious modification, for the remainder of the [17th] century and well into the eighteenth."<sup>14</sup> As a means of organizing and classifying all experience, it became the very heart and soul of the Puritan endeavor.

But the Ramism developed in the northern colonies differed, predictably, from that expounded in Europe. Under the impact of the colonists' millennial expectations, the perfect rationality portrayed by the Ramean places in fact became an objective means of salvation. The colonists required principles of order with which to organize and control their community. Yet those principles had to operate within the context of their holy mission. By tying the logical mechanisms of Ramism to the struggle for exist-

ence as well as the quest for spiritual truth, New England divines found they could provide justification for both their piety and their polity. The exigencies of the frontier rendered the pursuit of objective order synonymous with the pursuit of grace. This led the colonials, by extension, to view disorder as a substantive evil brought on by a lapse of method.<sup>15</sup> Encouraged by the conditions of settlement to thus reformulate their piety in the language of their logic, Puritan theorists effectively integrated the processes of redemption and rational endeavor. And this integration became the central paradox of intellectual life in the New World.

Yet, although the colonists grounded their sacral communities in a minutely articulated intellectual system, the faith which had launched their mission still demanded a piety whose "emotional propulsion was fitted into the articulated philosophy as a shaft to a spear-head."<sup>16</sup> Although conversion in its practical aspect might occur as an enlightening of the mind, it remained in its theological aspect a humbling of the heart. Hence New England Puritanism always harbored the implicit hazard of fostering a pietistic anti-intellectualism such as that raised up by Anne Hutchinson in the Antinomian crisis of the 1630's. In England, the force of tradition conspired with the vested interest of the clergy to thwart enthusiasm in religion and "levellers" in society. But in the New World, the frontier

conspired with uncertain political structures to lessen the prestige of rationality and encourage the pursuit of truth through direct revelation. This incipient threat to an already precarious order in turn forced colonial divines into the perilous position of placing a special emphasis on perfect rationality as the only path to righteousness.

"If every heated imagination is free to people the world with the hypostasies of its own fancy," Paul Shorey warns, "the result is chaos, not a teachable catechism."<sup>17</sup> But above all colonial leaders required a teachable catechism with which to invoke order. They had to bring revelation under the aegis of reason in order to enlist it in the service of a redeemed community. Significantly, Puritan doctrine maintained that God had bestowed revelation on man only after the Fall. He had added it, so to speak, to a completed creation as compensation for the loss of Grace. Revelation thus occurred as an afterthought, Miller claims, "devised for the emergency, but serving incidentally to substantiate and reenforce the pattern of ideas upon which the natural universe had been constructed."<sup>18</sup> The fact that Puritan dogma portrayed revealed truths as exemplars of creation allowed New England theologians to justify their emphasis on rationality as a means of salvation, thereby expanding the sphere of natural knowledge to the very boundaries of their faith.

Ramean method supplied them with an ideal mechanism for accomplishing this in its promotion of composite propositions. Ramus had claimed composite statements as the rational constructions which most clearly reflected the natural configurations of the mind. Going the "blessed martyr" one better, New England Ramists substituted Biblical authority for the "if" clauses in hypotheticals and prelapsarian rationality for the "inner monitor" which guaranteed disjunctives. In a crucial move, they rendered composite statements axiomatic and placed them in control of discourse.

A typical Puritan construction of a hypothetical proposition might run thus:

- If God has commanded that his children form churches, then all Saints in covenant with God must form churches.
- The Bible clearly states that God has so commanded.
- Therefore all God's children must form churches.

A typical Puritan construction of a disjunctive proposition might run thus:

- Either God created the world or He didn't.
- Any fool possessed of method must come to the conclusion that the rational order of nature could only have originated with God.
- Therefore, God created the world.

Under the rules of this logic neither the establishment of the Visible Church, nor the justification of political order, nor the creation of the world itself remained a subject for revelation. Natural reason could penetrate these

and all other questions as well. Indeed logical arguments of this stripe could lend authority to just about any statement, provided only that the Bible be sufficiently searched for premises and the method accepted as apodictic.<sup>19</sup>

This characteristic colonial reformulation of composite reasoning generated a correlative soteriology which stipulated that spiritual regeneration occurred as an actual event within the natural order. Since God had specifically structured human rationality for the apprehension of truth, he could treat with man through regular psychological channels. Moreover, he could reveal his truth through the objectively existent laws of method. Method, as a transcription of the divine order, gave immediate and infallible access to truth without recourse to supernatural means. According to this "doctrine of means" the process of conversion originated in nature with stimulæ received through the senses.<sup>20</sup> Through the logic of the places, man could interpret these impressions in the light of divine truth and so gain access to "natural revelation." The reenforcement of composite statements by Holy Writ and innate rationality conveniently guaranteed the absolute identity of these logical "arguments" with objective truth.

The doctrine of means effectively linked the Puritans' piety to a logical ground which justified their emerging theocratic order. By embedding "the light of logic and

dialectic" in the actual structures of the mind and confining revelation therein, New England Ramists declared philosophic allegiance to a naïve realism which effectively delimited the role of personal vision and ensured a preeminent place for natural reason in New England thought.<sup>21</sup> Moreover, by assuring Puritan divines that reason could not possibly encroach upon the truths of faith, the doctrine of means left them free to pursue natural knowledge wherever their innate rationality led them. Ramean logic, with its trust in direct perception, its immediate adjudication in disjunctives, and its fundamental reliance on the existence of an objective order, allowed the authors of the New England Way to dichotomize their theology into the separate spheres of faith and reason<sup>22</sup> -- and then to place almost total reliance on the latter. Spiritual revelation could serve only to validate the order and vindicate the method.

The comprehensive Ramist *ars technologicae* perfectly expressed the order and method in which New England placed its faith. It stipulated that the natural universe embodied the pattern of God's intention toward the world.<sup>23</sup> Logic served simply to direct the reason toward those ends enunciated by God in creation. *Technologia* thus effectively tied the pursuit of knowledge to the identification of purpose and wove "means" and "ends" into the very fabric of logic. Under the terms of the Ramist *ars technologicae*

all rational endeavor aimed at *eupraxia*, a Greek term meaning roughly "application" or "good conduct".<sup>24</sup> But in the New England canon *eupraxia* acquired the additional connotation of that practical use to which any theoretical construct must be put in order to justify its participation in God's wider purpose. The combined operation of *technologia* and *eupraxia* thus supported a significant shift away from a conception of logic as contemplation or inquiry to a powerful new conception of logic as a rule for action.

The conceptual link forged between "means" and "ends" by the application of Ramean constructs to colonial experience guaranteed that a deep-seated affinity would develop between the colonists' logic and their polity. And in fact the political implications of New England's peculiar logic did emerge in one of its most creative theoretical constructs -- the federal covenant. Miller describes the complex mechanisms of federal theology as "the capital instance of the Puritans' deliberate effort to combine their piety with their intellectual concepts, to preserve the irrational force of revelation and yet to harmonize it with the propositions of reason and logic."<sup>25</sup> Indeed covenant theology was not unique to the New World. The concept of the covenant as an organizing principle had in fact developed in the context of the Calvinism which dominated English and South German civic models. But covenantal theory in Europe had always operated within an

established political order. It never had the opportunity there that it enjoyed in the New World of contributing to the actual construction of a regime.

In the covenantal theory peculiar to New England, colonial divines invoked the controlling principles of Ramean logic in a forthright pragmatic injunction which made faith without performance a logical impossibility. They tied the inward obligations of their faith to the outward obligations of their fellowship and made ethics a corollary of election. Manifested politically in the Massachusetts Body of Liberties, the federal covenant effectively linked religious confession to social responsibility. It established the sacral community as a political entity with a clearly delineated program for the legitimation of communal values.<sup>26</sup> Further reenforced by the Cambridge Platform, covenant theology provided the institutional means for satisfying the conceptual demands of New England's logic and the spiritual demands of its faith.

In the federal covenant, New England magistrates found a logic of social control which, while offering an effective means of imposing external order, still expressed the positive ideals of their errand. By defining the justice of God in the rational language of Ramism, colonial leaders harnessed the master motive of salvation to the success of their communal enterprise and rendered the establishment of



political order a logical correlate of redemption. Under the terms of the covenant, and thanks to what Miller calls the "awe of logic" which controlled Colonial thought, the naïve realism implicit in Ramism imposed itself virtually unmediated on the development of Puritan polity.<sup>27</sup> The covenant supplied an external standard for the foundation of law in the apparent lawlessness of the frontier and gave man a definite legal status within a rationally comprehensible order. *Technologia* guaranteed that man could comprehend the standard. *Eupraxia* guaranteed that he could achieve the order. Thus armed with the strength of their faith and equipped with the tools of their logic, the children of the covenant set out to incorporate the metaphors of both into a powerful new conception of community which would have a determining impact on the construction of American political models.

As the frontier settlements matured, however, the careful balance struck between reason and faith by Ramist mechanisms became increasingly precarious. External pressures from political events in England, increased migration and economic growth, and the dispersion of the Saints to outlying districts combined with the dialectical tensions intrinsic to Ramism itself to set up a kind of "sympathetic vibration" between sacred and secular interests which shook the redeemed communities to their very foundations and forced them to revise their errand.

The adjustments attendant upon the abrogation of the Charter and the Restoration exemplify those required across the entire spectrum of political and intellectual life. The establishment of the Dominion renewed the crisis of legitimacy endemic to the colonies and forced a reevaluation of concepts of order and authority.<sup>18</sup> Compelled to support a policy of toleration and to replace their appeal to chartered rights with an exclusive appeal to the "rights of Englishmen," colonial theorists vainly tried to extend familiar constructs to encompass new and unsettling social realities. But they were caught with their doctrine in disarray by the Restoration, which restored them to citizenship, not orthodoxy. The enforced endorsement of tolerance spelled the end of their organic community. And the restructuring of political authority under the new regime reduced the Saints' unique status under the covenant to one specifically circumscribed by a compact designed to protect the Royal prerogative, not foster righteousness.

The reformulations precipitated by the social and political unrest in Stuart England paralleled and encouraged a similar process in the religious and intellectual sphere at home which permanently altered the disposition and thrust of colonial values.<sup>19</sup> As the "emotional propulsion" of the wilderness errand dispersed itself among the determined socio-economic forms of more established communities, the residual rationality which had driven the

mechanisms of Ramism asserted itself full force on the emerging order. The Half-Way Covenant gave further impetus to this process by enlarging the operational sphere of the doctrine of preparation and refocusing Christian endeavor on secular pursuits.<sup>30</sup> Faced with the attendant erosion of piety, New England divines fell back on rational method as a corrective for flagging faith. Significantly, however, political events forced this crucial revision before the introduction of Cartesian logic. Moreover, the ensuing process of adjustment had already achieved a certain precarious equilibrium before the introduction of Lockean constructs. This in turn ensured that, in the New World, Ramean models would underwrite the decisive transition from a religious to a secular axiology.<sup>31</sup>

Faced with the need for ideological reconstruction, Puritan leaders drew on the metaphors of *technologia* as a means to shore up their polity and those of *eupraxia* as a means to reinvigorate their faith. But in so doing they called down the full consequences of the rationality implicit in their logic. Indeed as the theological barrier of the covenant gave way and the energizing faith of the Fathers faded, the emphasis on human ability which had underwritten the doctrine of means gained force, until natural reason itself was deemed an adequate qualification for citizenship in the City. Forced to redefine their mission in the light of existing social conditions, the colonials

arrived ultimately at the conclusion that the New Zion lay outside the boundaries of Eden altogether, in that region controlled and defined exclusively by reason.

The decade of the 1720's marked a crucial moment in the joint processes of political and philosophical declension in New England. Within that decade the last of the true Saints died, leaving their troubled flock to cope with a series of social and intellectual crises which served only to aggravate the latent tensions which lay at the heart of their logic.<sup>32</sup> The judgement of the smallpox and the trauma of the witches forced the colonists to reevaluate the relationships which pertained between rational constructions and revealed truth. Under the stipulations of Ramist *technologia*, issues like "innoculation" or "testimony" could not be isolated within in a purely secular context. Questions of contagion related necessarily to analogical questions of spiri' al affliction and redemption. Conversely the notions of confession and conversion central to the withcraft trials related by analogy to secular principles of probity and truth.

Moreover, the concurrent controversies over currency and the Land Bank spun out a whole new set of metaphors which New England divines had to weave into the rational fabric with which they clothed their evangelical message. The introduction of mercantile metaphors opened a new logical frame of reference against which to judge the utility

of propositions. Henceforth the "if" clauses in composite statements could originate in the language of the marketplace and disjunctives could appeal to purely practical standards of utility. The result, Miller claims, was "an ethical quagmire to which ancient rules seemed every year less and less applicable."<sup>33</sup> And in one last decisive shift in metaphors, John Wise translated the outright display of anti-ministerial sentiment precipitated by declension into the language of politics, thereby transforming the theological issue of covenantal obligation into a sociological conception of compacted rights.<sup>34</sup>

All these eddying cross-currents of rapid social, political and intellectual change tended to muddy the logical waters of New England. This in turn diminished the ability of colonial leaders to formulate rational responses. Manifested rhetorically in the jeremiad, this conceptual disorientation appeared as an attempt to substitute an officially endorsed myth as a logical explanation for a complex of experience which no longer fit within accepted forms.<sup>35</sup> But the anomalous reliance of this myth on the direct perception implicit in composite reasoning, which in the context of the covenant had fostered an increased role for rationality, became something of an embarrassment to spokesmen trying to justify their authority under the new regime. Yet appeals to reason unsupported by an analogical order conceded far too much to

competing secular interests, while an unmediated appeal to intuitive perception always carried with it the incipient threat of enthusiasm.

"Enthusiasm...and method...are normally polar opposites," Ong notes. "But they are reconciled, or at least yoked to one another, in the Ramist cult of logic or dialectic."<sup>36</sup> The logical construct of the covenant had held these two in a precarious balance. But as the millennial dream faded and the organic polity fragmented under the impact of social and political forces, this balance degenerated into an uneasy tension.<sup>37</sup> The inability of colonial leadership to provide convincing rationalizations for the encroaching disorder encouraged a mounting sense of crisis. The faithful found themselves cast in a psychological drama whose text was logical confusion. This drama climaxed in the compelling scenes of the Great Awakening.

The Awakening embodied the inevitable confrontation between the "emotional propulsion" of Puritanism and its logical substructures. The systematic application of Ramean metaphors to the redemptive scheme of Calvinism had elicited the unforeseen correlary that spiritual regeneration could take the form of rational conviction. The dominant theories of faculty psychology, imported intact from 17th Century Oxford and Cambridge, had tended to re-enforce this view.<sup>38</sup> Moreover, Ramism and all its attendant

theoretical constructs had relied entirely on their ability to enforce a strict conformity between logical method and the objective order. Thus New England philosophy had always run the risk of having its spiritual dimensions subsumed under the causal postulates of its logic.

Indeed throughout the 17th Century, the doctrine of means had encouraged New England divines to accept scientific advances at face value without examining them for hidden threats to doctrine. But as the full implications of Newtonian physics began to assert themselves on the colonial consciousness, the dangers inherent in mechanical constructs became ever more apparent and more acute. For if in fact the objective order conformed to the demands of Newton's model, the implications for orthodoxy under Ramean dialectic proved devastating. If the psychological reflex invoked by the doctrine of means actually complied with the mathematical laws of mechanical causation, the notion of moral responsibility vanished in a puff of logical smoke, leaving the covenanted community without a logical ground on which to stand.

Seen in this context, the Awakening expressed a renewed search for metaphors capable of expressing the changing realities of colonial life.<sup>39</sup> The perfect rationality of Ramism could no longer support or express the actual experience of the community. To make matters worse, the all-powerful Ramean method no longer seemed able to absorb the

data of the physical sciences -- at least not without endangering its doctrinal base. Clearly the Citty needed a new logical prophet, one who could restore the original errand to conceptual conformity with present experience without sacrificing its evangelical thrust to the mechanisms of science. Jonathan Edwards complied with a unique philosophical program which integrated Newtonian and Lockean metaphors into the logical substructures of Ramism. Armed with a working knowledge of the new learning and a passionate devotion to the old faith, Edwards forged an analytical link between the two which would carry the Saints forward to citizenship in a national Eden.

Edwards relieved the intolerable tensions endemic to New England logic by formulating a *psycho*-logical identity for the faithful.<sup>40</sup> In reaction against the increasingly irrelevant federal covenant, Edwards recentered the spiritual life in the individual. Locke's empirical psychology provided him with metaphors ideally suited to the task. By deemphasizing the importance of the external covenant and tying the internal covenant to the processes of association, Edwards found that he could revalidate the spiritual, regenerative features of Puritan piety without overtly disavowing the intellectual structures which supported Puritan polity.

The Ramists themselves had prepared the way for Edwards by systematically dissecting the psychology of conversion



in order to clarify the fatal principle of preparation. But, always fearful of enthusiasm, New England divines had consistently emphasized the purely rational aspects of conversion. Edwards, by contrast, employed the associative principles of Locke to extend the operation of Grace beyond the understanding to include the affections and the will. He had learned from Locke that the reason, imagination and will did not function as separate faculties as the Ramists had assumed. Rather they expressed functionally discrete aspects of an integrated human personality. Replacing the metaphors of faculty psychology with Lockean images, Edwards argued that the human mind in fact operated as a single organic unit in cognition. His orthodoxy naturally led him to identify God as the ultimate source of human thought and action. But his Lockean orientation led him at the same time to insist on a psychosomatic conception of man. Through "laws of...union which the Creator has fixed between soul and body," he claimed, man became a totally integrated creature whose psychological make-up held him in perfect harmony with the natural order.<sup>41</sup>

Edwards extended Locke's epistemology across the economy of salvation by subsuming the protean concept of experience under the covenant of Grace. Under Edwards' analysis, the Lockean metaphors of experience expanded to encompass all of man's physical and spiritual reality. "Divine things" became a part of the data of the senses.

Man could therefore "experience" Grace as a psychological reorientation which permitted him to perceive more clearly -- not understand more fully -- the loveliness -- not the order -- of God. Through a "spiritual sense," man gained a taste of the "superlative excellency of divine things" rather than a rational comprehension of their design. Edwards defined the infusion of Grace as God's means of determining the will to virtuous action, not as his means of bringing reason into right relation with truth. "In religious matters," he warned, "the spring of [men's] actions are very much religious affections; he that has doctrinal knowledge...without action, never is engaged in the business of religion." Hence in a crucial shift in images, Edwards relocated the "spiritual sense" which governed conversion in "the will and inclinations" of the heart.<sup>41</sup>

Edwards thereby ensured that notions of moral responsibility would survive despite the application of mechanical models to the natural order. Indeed Edwards, from the vantage point of his Lockean psychology, could recognize what the Ramists, as slaves to their method, could not -- that the ultimate enemy to faith lurked in an identification of God with the laws of motion. Although Edwards' theology would allow him to accept Newtonian physics as an accurate description of the natural order, his psychology militated against accepting that order as a

complete explanation of man's spiritual reality. So, as Paul Conkin explains, "while the Deists were using Locke to justify a rational and unemotional religion and Newton to justify a mechanistic and self-sufficient universe, Edwards used Locke to explain the phenomenon of conversion and Newton to prove the Glory of God."<sup>43</sup>

Ironically, however, Edwards' Lockean defense of the will, intended as a psychological argument for orthodoxy, coincidentally reenforced the Ramean doctrine of natural ability. The Ramists had argued that the natural structure of the mind gave man a rational ability to pursue truth. Edwards redefined that rational ability in psychological terms, as a "moral agency" which gave man the ability to pursue virtue. Differentiating between "natural" and "moral" ability, Edwards described the first as arising from external factors and therefore irrelevant to issues of conduct. Moral ability, on the other hand, he portrayed as intrinsic to the will and arising from "propensities" which resolved, in the last analysis, into motives. A moral agent, he claimed, possessed "a moral faculty...and a capacity...of being influenced in his actions by moral inducements or motives." But, under the influence of Locke, Edwards' had grounded his defense of the will on principles of association and this had led him, in turn, to formulate virtue in psychological rather than theological terms. "If a man's will is truly right and lovely,"

Edwards argued, "he is morally good or excellent."<sup>44</sup> And this crucial shift in perspective effectively placed spiritual redemption on the same analytical plane as ethical probity.

Indeed only Edwards' orthodoxy kept him from developing his argument for a "spiritual sense" into a purely secular theory of "moral sense" after the manner of Hutcheson. For although within the confines of orthodoxy Edwards' reconstructed will reaffirmed the sovereignty of the God who shaped and determined it, outside the boundaries of faith the psychological argument for moral ability in fact supplied a logical justification for human agency. Thus, although by establishing a role for "religious affections" in the process of conversion, Edwards mitigated the theological dangers implicit in Newtonian physics, he coincidentally supplied therein a logical mechanism for transferring the evangelical thrust of the original errand onto the emerging secular order.

Edwards' reformulation of the will clearly offered a psychological release to Saints torn between the emotional demands of their faith and the rational demands of their logic. By joining the "emotional propulsion" of Protestantism to the perfect rationality of Ramism through the medium of Locke's psychology, Edwards provided an outlet for the tensions which had precipitated the Awakening. Eventually the religious affections which drove Edwards'

will would supply the impetus for a characteristic American theology which subordinated the forensic elements of Puritanism to a new ideal of practical activity in the Church. Under Edwards' metaphors of moral agency, the narrow sectarian vision of the City ultimately gave way to the wider concept of "universal benevolence" which offered a rational explanation of the relationship which pertained between Newton's laws and the decalogue.<sup>45</sup>

But in the context of the present study, Edwards' revised logical metaphors had a more far-reaching consequence. For while he redefined the moral agent as an individual motivated by objective truth, Edwards nonetheless maintained the characteristic Ramean commitment to a fully articulated and rationally ordered world.<sup>46</sup> Indeed only his deep faith in the transcendent conceptual order reflected in the *ars technologicae* saved him from the philosophical fate which the Deists suffered as they struggled to adapt Newtonian physics to a religious world view. Hence, while arguing for "religious affections" as the engines of salvation, Edwards coincidentally argued for the possibility of independent action within a rational framework of order and authority. At a crucial moment in the development of a national consciousness, Edwards offered a rationally defensible means by which freedom and law could work together within an overarching logical structure.

In the context of colonial America, and particularly in the atmosphere of disruption which engulfed New England at the turn of the 18th Century, these principles of personal freedom and positive law acquired a special urgency. Colonial theorists, faced with a rapidly changing political reality, had to maintain authoritative order at home without subjecting themselves to it abroad. They therefore needed to define the freedom of the individual within a lawful community while simultaneously articulating the freedom of that community in relation to the Crown. At the hands of Whig theorists in London, Lockean constructs had translated easily into theories of rights which fit into an existing framework of common law. But colonial theorists, forced to wrest a viable order from a chaotic frontier, could not rely on the slow, cumulative processes which supplied the principles of common law. The political constructs derived under the impact of Lockean theories in the colonies thus proved quite different from those devised by English Whigs. And the conceptual differences between the two in fact relate directly to the logical substructures upon which they rested.

Locke had based his political theories on an inferential logic. But for Locke, inference had no ontological status. It consisted simply of a cognitive process which traced "the order and connection of ideas" and supplied contingent premises for existential propositions. Edwards,

on the other hand, defined the connection between ideas as logical, not psychological. Although he abandoned faculty psychology for Lockean constructs in his discussion of the will, on methodological issues Edwards remained firmly in the Ramist camp. The order and connection of ideas, he argued, expressed no purely cognitive process, but rather a "full and fixed connection between the things signified by the subject and predicate of a proposition."<sup>47</sup> This "full and fixed connection" conveniently allowed Edwards to deny the operation of efficient causes outside the natural order, which in turn rescued the spiritual process of regeneration from Newton's mechanical models. But although theologically motivated, Edwards' argument for a "full and fixed connection" between terms remained explicitly logical.

According to Edwards, three types of propositions could express a "full or fixed connection" -- the first "self-evident," the second "historical" and the third "composite." A self-evident connection occurred when the obverse of a proposition implied "a contradiction, or gross absurdity." An historical connection pertained when "the existence of whatever is already come to pass, is now become necessary." And a composite connection merely expressed "the connection of two or more [such] propositions one with another."<sup>48</sup> These three principles of connection, Edwards claimed, controlled all logical method.

Edwards' debt to his Ramean forebears is patent here. His "self-evident" connections in fact express disjunctive propositions placed under the jurisdiction of prelapsarian rationality, while his "historical" connections collapse easily into hypothetical statements grounded, typically, in the data of experience referred back to Biblical authority. Moreover, Edwards' "composite" connections explicitly recall their Ramean counterparts, which similarly merged the disjunctive and the hypothetical into a hybrid argument. Indeed, all three of Edwards' "principles of connection" relate back to composite forms, since, as he himself stipulates, all composite reasoning "is either fully and thoroughly connected with that which is absolutely necessary in its own nature [i.e., the self-evident], or with something which had already received and made sure of its existence [i.e., the historical]."<sup>49</sup> Hence, although undeniably committed to the psychological aspects of the new learning, Edwards remained committed in the construction of his logical model to principles markedly similar to those which had controlled the logic in which he was schooled -- a logic explicitly grounded in Ramean metaphors.

Edwards' Ramean principles of connection provided the vocabulary for his defense of moral agency, which rested on the assumption that the rules of method themselves precluded the possibility of natural causes producing moral



effects. Natural and moral causes, Edwards claimed, operated within different orders -- that is, they resided in different "places." Therefore one could never demonstrate a self-evident or historical connection between a natural event and a moral consequence. And since composite connections, the only other acceptable form of argument, consisted simply of combinations of these two, a "full and fixed" connection between a natural cause and a moral effect became a logical impossibility. Freedom in the moral order could therefore subsist as an integral but autonomous part of a strictly determined natural order. Under the operation of Edwardsean logic, moral agency in fact expressed a kind of independent "law of motion" which, within the limits of human ability, contributed to the pattern of existence.

Edwards' argument for moral agency portrayed freedom as an antecedent law grounded in logic, not a derivative right grounded in inference. And herein lay the fundamental difference between the respective political models developed on either side of the Atlantic. English Whigs had inferred the concept of individual freedom from an established political model and treated it as a derivative right within that model. But in the colonies, freedom had asserted itself as an existential reality coincident with a compelling need to establish principles of order. Since the circumstances of colonial life demanded that concepts of order

be cut from the whole cloth of colonial experience, and since individual freedom constituted an important part of that experience, colonial political models had to incorporate concepts of freedom into their logical structure -- not as a derivative effect, but as an integral cause. Edwards' logic, building on Lockean psychology but grounded in a Ramean ontology, supplied the means to accomplish just that.

Although the drama of the Great Awakening had substantially played itself out by 1750, the theoretical constructs developed under its impact remained to become permanent features of American intellectual life.<sup>50</sup> Oscar Handlin points out that "few colonists, by 1750, had actually read the works of Sir Isaac Newton or of John Locke."<sup>51</sup> But most had been drawn into the ferment of the revival. This allowed Edwardsean models to be imposed largely unmediated on a colonial consciousness amply prepared to receive them by its Ramean heritage. Indeed Locke and Newton ultimately entered Colonial political and scientific models clothed in a fabric woven from the metaphors of Edwardsean orthodoxy and the images of Ramean ontology. Moreover, although Edwards died in 1758, his influence persisted through the posthumous publication of two of his major works as late as 1788. Indeed, even into the 19th Century, Edwards still reached out into American intellectual life through an educational system staffed

primarily by teachers thoroughly schooled in his principles and itinerant preachers who fanned the flames of subsequent revivals.<sup>52</sup>

By releasing the psychological tensions endemic to Puritan logic, the Awakening freed colonial theorists to make constructive use of the logical metaphors preserved in Edwards' model. Thus, in a sense, it served to hypostatize the structural elements of the New England Way. For although ostensibly the application of Lockean psychology seemed to discredit Ramean logical constructs, in fact Edwards' insistence on a "full and fixed" connection between ideas insinuated them anonymously into the substructures of American thought. Through Edwards' reformulation of the will, the metaphors of the naïve realism which lay at the base of Ramean logic became a part of "the huge, unrecorded hum of implication" which sustained American intellectual life.<sup>53</sup> In the decades which followed, the architects of the Revolution would construct legal models on the foundation which Edwards had laid -- models which institutionalized the metaphors peculiar to his logic.

CHAPTER NOTES

1. Miller points out how dependent the colonists were on that model which they brought with them which became "frozen in time" so to speak under frontier conditions. The logical systems which "were disputed so furiously in the universities of Europe" had little impact on the logic which was "taught so serenely at Harvard and Yale" (Mind, 141).

2. Gordon Wood argues for an ideological cause and effect in The Creation of the American Republic (Chapel Hill, 1969); T. H. Breen attributes local variations to cultural backgrounds in Puritans and Adventurers (New York, 1980); C. M. Andrews points out the importance of the frontier in The Colonial Background of the American Revolution (New Haven, 1931); Daniel Boorstin (The Americans: The Colonial Experience (New York, 1958) and The Genius of American Politics (Chicago, 1953)) and Lewis Perry (Intellectual Life in America: A History (New York, 1984)) both cite environmental factors as formative while James Henretta cites the persistence of a pre-commercial ethic (Evolution of American Society: 1700-1815 (Lexington, 1973)). Others like Bailyn, Robbins and Miller trace American institutions to Continental sources. The list goes on...

3. Andrews notes that the general confusion characteristic of English conceptions of law during this period was a deciding factor in the independent political development of the American colonies, citing not only domestic upheavals but also the failure of the Crown to develop a clearly defined colonial policy (Colonial Background, 47-65). Oscar Handlin agrees that the British failure to "rationalize" its Colonial policy allowed the colonies to circumvent and eventual to subvert the purposes of the Crown, contributing eventually to a "significant inversion" of English law (The Americans (Boston, 1963), 81). Conkin points out that "nothing in the British constitution, in the ancient laws of the kingdom, or in legal precedents governed mother-colony relationships. The absence of a governing compact meant a constitutional lag at the very least. It also meant that colonists reverted to a state of nature and regained the rights that pertain to it" (Self-Evident Truths (Bloomington, 1974), 36).

4. The word "puritan" has been called on by scholars to label theological reactionaries, pious revolutionaries and political conservatives. Used indiscriminately to describe philosophical propensities, economic entities and social institutions, the word itself has undergone a

declension not unlike that of the original concept, its meaning dispersed among its principal parts. It is not my intent to indulge in partial perspectives here but rather to accept the mere fact of Puritanism as a complex of ideas operative within colonial America at a point in time crucial to the development of its theoretical constructs. For the rest, the reader is referred to the vast body of work discussing Puritanism in its concrete effects.

5. John Winthrop, "A Modell of Christian Charitie" in Edmund Morgan, Puritan Political Ideas (Indianapolis, 1965), 92.

6. The northern colonies were clearly not the only ones established under letters of patent from the Crown. Likewise Virginia remained for almost two decades the property of a chartered corporation. But in Virginia questions of authority, although complicated by distance, were not further complicated by the myth of a holy mission. The Royal Governor in Virginia never competed with God for his authority, only with a board of stockholders meeting in London. Moreover the Crown abrogated Virginia's charter early on and established it as a royal province. While this couldn't solve the mechanical problems of administration at a distance, it did resolve those questions of legitimacy which continued to plague the northern colonies. For a discussion of issues of legitimacy in the northern and southern colonies see Handlin, Americans, 41-55; Breen, Puritans; Michael Kammen, People of Paradox (New York, 1972).

7. "The charter of the Massachusetts Bay Company was a concession by the Crown which had breathed life into that legal fiction," Loren Baritz explains. "[But] it was obvious that a creature of the state could not be a state itself, that a corporation could not be an independent sovereign" (City on a Hill, (New York, 1964), 38-39).

8. S. E. Morison, The Intellectual Life of Colonial New England, (Westport, 1956), 43.

9. Miller, Mind, 118, 501. The *Dialecticae* was in John Harvard's bequest and in the libraries of several Harvard undergraduates. In 1648 John Ive imported thirteen copies. Almost all the subsequent expounders of Ramism also appeared on colonial bookshelves, including Beurhusius, Piscator, Temple, Milton, and Richardson. The encyclopedists Alsted and Keckermann were "especially used as reference works in New England" (Ibid., 494-501; 102; 118-120). But New England's primary source of Ramist doctrine was William Ames whose *Medulla Sacra Theologicae* (1623) was "the standard work used at Harvard and Yale down to the middle of the 18th Century" (Perry Miller, The

Puritans (New York, 1963), 66). In the 1670's the *Medulla* was reenforced at Harvard by Wollebius' *Abridgement of Christian Divinity*, which expounded the "common places" as the source of "exact and perfect" doctrine, and further bolstered in the 1720's by van Mastricht's *Theoretico-Practica Theologia*, which Miller claims brought "a hundred years of methodizing to a stupendous fulfillment" (Mind, 96). See also Minor Meyers, Jr., "A Source for Eighteenth-Century Harvard Master's Questions," WMQ 38 (1981):261-267. For the presence of Ramean works in colonial libraries see A. C. Potter, "Catalogue of John Harvard's Library," Publications of the Colonial Society of Massachusetts XXI (1919); A. O. Norton, "Harvard Textbooks...of the 17th Century," Ibid., XXVIII (1935); Julius H. Tuttle, "The Libraries of the Mathers," Proceedings of the American Antiquarian Society New Series, XX (1910); C. F. and R. Robinson, "Three Early Massachusetts Libraries," Publications XXVIII (1935). For a specific treatment of William Ames and his impact on New England thought see K. L. Sprunger, The Learned Doctor William Ames (Urbana, 1972).

10. Miller, Mind, 121; Puritans, 30.

11. Increase Mather's preface to James Fitch, *The First Principles of the Doctrine of Christ* (Boston, 1679), quoted in Miller, Mind, 117. The Mathers came by their Ramism naturally, Richard having been "set the task of reading the works of Peter Ramus" at an early age (Howell, Logic, 192).

12. Miller, Mind, 116.

13. Sacvan Bercovitch, The Puritan Origins of the American Self (New Haven, 1975), 113. Moreover, the major contributors to New England Ramism were Dissenters who formulated their Ramist doctrines while in exile. They were therefore one step removed from the main stream of English Ramism which followed the mistaken lead of McIlmaine. Ong's Inventory in fact shows that publication patterns of Ramist texts in the Low Countries differed markedly from those in England (see above, Note #), with over twice as many editions of the *Dialectic* appearing between 1580 and 1700 as of the *Rhetoric*. In fact, Ong's figures show that during the twenty years following the publication of Descartes' *Discourse* (1637) and *Meditations* (1641), there was a surge of interest in Ramean dialectic in the Low Countries, with fifteen editions of the *Dialectic* appearing during this period alone (Ramus, 298). Sprunger refers to the Netherlands as the "print shop of Puritanism" because of the flood of Ramean works which poured forth from its presses to feed the minds of English Dissenters (Ames, 256).

14. Perry Miller, The New England Mind: From Colony to Province (Cambridge, 1953), 14.

15. New England Puritans saw logic as a particular gift from God "bestowed upon fallen and hapless humanity, in order that they might not collapse in the ineptitude they had brought upon themselves. Considered, therefore, in the light of logic, the fall of man amounted in effect to a lapse from dialectic; the loss of God's image, reduced to the most concrete terms, was simply the loss of an ability to use the syllogism, and innate depravity might most accurately be defined as a congenital incapacity for discursive reasoning" (Miller, Mind, 111).

16. *Ibid.*, 67.

17. Paul Shorey, Platonism Ancient and Modern (Berkeley, 1938), 84.

18. Miller, Mind, 188-189. See also Hooykaas, Religion, 89-96, 137-149.

19. It is important to note here that the intuitive grasp of correct alternatives in a Ramist disjunction bears no resemblance to Cartesian intuition. New England Ramism was "a logic for dogmatists," Miller affirms, but stresses elsewhere that it worked for the "preservation of intellectual values within that dogmatism" (Mind, 138; Puritans, 55).

20. *Ibid.*, 281-299.

21. "Puritanism exorcised the ghost of Occam," Miller claims (Mind, 166). He argues strongly for the realist strains in New England thought, claiming them as the "strength of Puritanism" (Puritans, 59). "[The] division between Peripatetics and Ramists," he argues "can...be said to coincide roughly with a division between nominalists and realists. ...Thus the ancient battle over universals was renewed." The genius of Puritan logic, Miller argues, is that it *did* "take hold of reality," giving a means of conferring order on chaotic frontier experiences (Mind, 146-147).

22. "Theology in two parts," Sprunger notes, "was a Ramist gift to theology" (Ames, 140). Theology for Ramus became *ars bene vivendi* -- the art of living well. See *Commentary on the Christian Religion* (1577).

23. For a conceptual outline of *technolgia* see Schneider, History of American Philosophy (New York, 1946), 5-11. For discussions of its impact on Colonial thought see Sprunger, Ames, 105-126 and Miller, Mind, 154-180.

Miller gives reams of textual examples which portray *technologia* in its New England context, while Sprunger places the doctrine in a European frame and traces its transmission to the New World.

24. For discussions of *eupraxia* see Miller, Mind, 163-180 and Sprunger, Ames, 115-120. Miller argues that "almost every development of thought in 17th and early 18th Century New England can be traced in large part either to unforeseen implications in this doctrine or to efforts at smoothing out inconsistencies" (Mind, 173-175).

25. Miller, Mind, 397. For a detailed discussion of covenantal polity see Miller's comprehensive chapters in The New England Mind and From Colony to Province. For an exhaustive bibliography on the European sources of covenant theology see Miller's appendix in Mind. For a discussion of its European manifestations see Sprunger, Ames, 156-205.

26. Puritan life in New England was centered upon a corporate and communal ideal, a fact made manifest in the role which sermonizing played in political and ecclesiastical life. See Miller, Mind, 297-299; Sacvan Bercovitch, The Puritan Jeremiad (Madison, 1978); Daniel Boorstin, The Lost World of Thomas Jefferson (Boston, 1948), 3-13. Ralph Barton Perry points out that the members of the Puritan community "were conceived as so linked together as to have their spiritual fortunes in common." This "broad principle of solidarity", he claims "is not grasped until it is understood that [Puritan] piety is intrinsically social in its nature or quality. It is not merely that the piety of the individual cannot be achieved, protected, and advanced, but that it cannot be *possessed* and *enjoyed* in isolation" (Puritanism and Democracy (New York, 1944), 327-334).

27. Miller, Mind, 425. Miller claims the covenant as "the master idea of the age" (*Ibid.*, 21). H. R. Niebuhr likewise portrays the doctrine as "a fundamental pattern in American minds in the 17th, 18th and early 19th centuries" ("The Idea of the Covenant and American Democracy" in McGiffert, Puritanism, 219). Bercovitch argues that covenant theology represented a logical and rhetorical inversion which fused secular and sacred identities and "invoked the national epic heuristically to complete the epic of the soul" (Origins, 118, 120, 125-135).

28. Miller portrays the years of the Dominion as "a tremendous gulf; after crossing them, the community emerged basically altered, radically transformed" (Colony, 150). Kammen agrees that "the social and political crises of Stuart England obliged colonists, Cavalier as well as Puritan, to redefine their relationship with the home culture, and forced them to recognize...that they were not



simply Englishmen living *outré mer*" (Paradox, 202).

29. Declension in New England is a huge topic, reaching out to all aspects of colonial life. My intention here is to discuss it as a logical issue -- as the beginning of a uniquely American way of dealing with the problems of reality. For more conventional treatments see Miller, Colony; David M. Scobey, "The Mirror of Puritan Authority," WMQ III 41 (1984):3-31; Morgan, Puritan; McGiffert, Puritanism; Morison, Life.

30. See Miller, Colony, 110-118, 228-247. For a related discussion see Morgan, Puritan, xv-xix; Charles Constantin "The Puritan Ethic and the Dignity of Labor: Hierarchy vs. Equality," JHI 40 (1979):532-561.

31. For the chronology relative to Descartes, see above note #. The introduction of Locke Miller places in the period directly following the crucial year 1721, pointing to a 1725 preface by John Bulkley as "the first in New England in which Locke is extensively quoted and understood." In 1726, Miller notes, Eliphalet Adams sent his son to Yale "armed not only with Ramus but with Locke" (Mind, 432).

32. See Miller, "Vale atque ave", Mind, 481-485. Miller, in fact, narrows the crisis point down to the period 1720-1721 (Colony, 371, 380, 456).

33. Miller, Colony, 308, 310.

34. Wise's *Amicus Patria* anticipated the revolutionary tracts of Allen, Franklin and Paine. For a discussion of "Wise's Cursed Libel" see Miller, Colony, 288-302.

35. Miller describes the jeremiad as "the voice of the community bespeaking its apprehensions about itself" (Colony, 47, 52). For a theoretical discussion of the jeremiad see Bercovitch, Jeremiad, which expands Miller's interpretation and argues that, as well as expressing an ideological consensus, the jeremiad in fact expressed a cultural affirmation. Not all scholars take Bercovitch's philosophic view. Baritz, for instance, claims that the jeremiad "did permanent damage to the future social history of America" (City, 61).

36. Ong, "Peter Ramus and the Naming of Methodism: Medieval Science Through Ramist Homiletic," JHI 14 (1953):248.

37. Conkin points out that "the Puritan, by the drive of his overly dichotomous logic, set up almost unbridgeable polarities and extremities" (Truths, 34). Bercovitch calls

the result "a relentless psychic strain" (Origins, 23). The rhetorical form of the jeremiad amplified this tension and acted ultimately as a force for psychological and social disruption. Miller represents Cotton Mather as the archetype of this tension, portraying Mather's curiously unbalanced personality as a reflection of the dialectical confusion which plagued his generation (Colony, 429). Jeffrey Jeske likewise represents Mather as the expositor of "a fundamental split in the Puritan mind." See "Cotton Mather: Physico-Theologian," JHI 47 (1986):583-594.

38. Miller claims that faculty psychology "was a part of the intellectual heritage which the Puritans accepted without criticism, almost without realizing that it was a doctrine, since to them no other concept was available. ...They retained without substantial change the orthodox scholastic ideas of the soul, of its composition and its faculties...until the beginning of the eighteenth Century." Transmitted through texts like that of the Dutch Ramist Rudolph Snell, faculty psychology established itself as a complementary physical explanation for Ramean logical truths. Miller argues that faculty psychology "supplied the physiological foundations for the Ramist logic" (Mind, 242-267). See also Schnieder, History, 202-207.

39. Note also that, although the Awakening has been interpreted by some as the first "national" event, it was in fact most sharply defined in New England where logical issues dominated all political, social and philosophical discourse (Baritz, City, 62). The battle had already been joined in New England by 1689 in the controversies between Stoddard and Mather over the Half-Way Covenant and had thereafter remained a permanent feature of New England's dichotomous intellectual life.

40. For a general and accessible discussion of Edward's psychology and theology see Baritz, City, 47-90.

41. Jonathan Edwards, Basic Writings (New York, 1966), 124-134, 187.

42. *Ibid.*, 126, 193, 185, 187. Edwards' doctrine is not, however, to be confused with the Arminian doctrine of the will, which he intentionally set out to discredit (*Ibid.*, 219, 196-201).

43. Conkin, Puritans, 45.

44. Edwards, Writings, 216-226.

45. Baritz, City, 71. Benevolence, Miller claims, discovered the "greatest common denominator" among the fragmenting sects which proliferated during the Awakening

(Colony, 410). Institutionalized in the New Divinity theology of Dwight, Belamy and Hopkins, the concept of benevolence issued in the social gospel of Nathaniel Taylor, which stood on the characteristic composite statement that universal depravity is not consistent with the moral perfection of God. For discussions of benevolence as a force for conservatism see W. David Lewis, "The Reformer as Conservative: Protestant Counter Subversion" in Stanley Coben's Development of an American Culture (Englewood Cliffs, 1970) and Leonard Labaree, Conservatism in Early American History (Ithaca, 1948), 60-89.

46. Conkin points out that Edwards "always searched for the complete design" and displayed "an unending interest in the corporate whole" (Puritans, 46, 71).

47. Jonathan Edwards, Freedom of the Will ed. Paul Ramsey (New Haven, 1957), 131.

48. Ibid., 153

49. Ibid., 153.

50. For a discussion of the permanent effects of the Awakening on American culture see Richard Hofstadter, America at 1750: A Social Portrait (New York, 1973); C. E. Olmsted, History of Religion in the United States (Englewood Cliffs, 1960); Alan Heimert, Religion and the American Mind: From the Great Awakening to the Revolution (Cambridge, 1966).

51. Handlin, Americans, 127.

52. For discussions of the determining effect which sectarian colleges had on the development of American thought see Morison, Life, 27-112 passim; Labaree, Conservatism, 91-118. See also Morison's treatments of Harvard College.

53. Lionel Trilling, The Liberal Imagination (New York, 1976), 112.

## Chapter 7

### ORDER IN THE COURT:

The Logic of Law

in

America

The Awakening evoked the first expression of national consciousness in colonial America. Under its impact the metaphors of conversion central to the original errand became the cornerstone of a national identity in which the perfection of the individual extended to a new social ideal. As itinerancy undermined insular local models and forced the expansion of political perspectives, the unrealistic sense of total community which had underwritten Puritan polity eventually shaded into a more pragmatic sense of actual community.<sup>1</sup>

By integrating the millennial axiology of the Saints into the wider economy of secular values, the Awakening provided the colonies with a comprehensive national ideal. In the light of the revival experience, the redemptive meaning of America became legible in the promise of the New Jerusalem. Edwards himself had developed this theme in his *Faithful Narrative of the Surprising Works of God*, where he described the movement of the Holy Spirit in the

Great Awakening as a probable prelude to the conversion of the world. The establishment of the Visible Church in America, he claimed, constituted the last act in the drama of salvation.<sup>2</sup> The debates surrounding the Half-Way Covenant had anticipated this projection of Puritan ideals onto secular models, but the Awakening legitimized the outward focus of religious energies and justified their application to the national myth.

By transferring the evangelical thrust of the errand from the first to the second table of the decalogue, Edwards had supplied a means for translating the logical language of the covenant into an expression of social and political purpose. The development of revolutionary sentiment throughout the 1760's thus amounted to a swelling ritual of national affirmation.<sup>3</sup> In a reciprocal process of reenforcement, religious leaders incorporated the rhetoric of politics into their salvation history, while revolutionary ideologues usurped the images of a Holy War to support their political platforms. Whig sermons replaced the jeremiad as a litany of hope and political pulpits rang with the promise that independence would initiate the chiliad.

At the base of American revolutionary rhetoric, therefore, lay an ontology which perpetuated the metaphors of Ramism in American political life. Ramean forms in fact supported an entire national mythology which emerged as

justification for the political case against George III.<sup>4</sup> Boorstin defines this national mythology as "a belief in 'givenness', [which] seeped into the interstices of the Puritan dogma and was gradually to dissolve...into a more general faith in the magical definition of American purpose." Americans enjoyed a characteristic belief, he claims, "that values are in some way or other automatically defined: *given* by certain facts of geography or history peculiar to us, ...[or] that values are implicit in the American experience."<sup>5</sup> Paul Conkin likewise argues for a characteristic "backdrop of theory" against which Americans constructed their theoretical models.<sup>6</sup> But neither Boorstin nor Conkin ties their observations to the logical vocabulary controlling the construction of those models. The present argument, on the other hand, suggests that this "backdrop of theory", this "belief in givenness," derived directly from the metaphors implicit in Ramean constructs, perpetuated, in modified form, by the logic of Jonathan Edwards.

Thanks to the translation of millennial expectations accomplished through Edwards' logic, America had in fact been conceived in thought before it became a political reality. The Awakening had produced a national mythology long before the Revolution produced a nation. And this ideal informed all the theoretical constructs which flowed from it. 18th Century Americans could thus represent their

emerging institutions as models for the world. They were "among the last children of an expanding West," Conkin claims, "who could, out of innocence rather than racial or cultural arrogance, still marshal cosmic support for their fondest aspirations."<sup>7</sup> Yet this "cosmic innocence" could not have survived in the face of Lockean reductionism. It required the realist ontology of Ramism to support and justify it.

As a consequence of their Ramean heritage, American political theorists in fact explicitly demanded that their models express a universal content.<sup>8</sup> Derivative rights inferred from human events could not provide a sufficient logical ground for a nation "conceived in liberty." In Ramean terms, Lockean rights expressed "inartificial arguments" -- that is, predicates derived from a logically inadequate process which had a merely notional base. Lockean rights defined equity and a political psychology. But they expressed no logical truth. The millennial mission of America, however, required that political principles be grounded in an antecedent order derived methodically from "artificial" arguments which actually expressed the concurrence of rational forms with objective truth. Locke, working from an inferential logic, could view rights as opportunities for individual activity. But American theorists needed to view rights as legal obligations to an antecedent moral order.<sup>9</sup> They required objective laws

grounded in inherent structure -- laws which could provide normative principles but still ensure that the society developed under them would fulfill its larger purpose.

At the heart of Revolutionary rhetoric, Lester Cohen observes, lay "an unstated epistemological assumption...[which] entailed the articulation or, at the very least, the presupposition of an immutable standard of value against which the necessity and the propriety of the Revolution could be measured."<sup>10</sup> The present argument suggests that this "immutable standard" in fact expressed a political extension of Ramist *technologia*, filtered through Edwardsean logic. The "unstated epistemological assumption", which Cohen mistakenly locates in colonial rhetoric, in fact subsisted as the realist ground of colonial logic. (Indeed, any good Ramist would accuse Cohen of having committed the crime which Ramus himself found most dire -- that of assigning a rhetorical function to a logical "place"!) Revolutionary spokesmen simply subsumed the metaphors of Ramism, along with the rest of their intellectual heritage, under their political models. But where New England divines had controlled their method through the invocation of Holy Writ, political ideologues controlled theirs through juridical evidence drawn from Vattel, Pufendorf and Burlamaqui. The result was a unique amalgam of rationalism, moralism and piety derived from classical sources, but developed through Ramean forms.



The circumstances of the colonial environment conspired with the millennial axiology of the Awakening to make New England models dominant in Revolutionary thought. A system of public education established as early as 1641 and supported consistently thereafter, more compact patterns of settlement, and an urban mentality all encouraged the articulation of a cogent body of New England "thought" which could be effectively developed and transmitted through a sectarian educational system. By contrast, larger agricultural holdings in the Tide-water colonies encouraged settlement patterns which militated against public education. There, education remained primarily a private affair enjoyed by a landed elite. The promising young minds of the Middle Colonies pursued advanced education on the Continent -- or at Harvard or Yale.

The characteristic American formulation of sovereignty, when compared with developing European constructs, clearly illustrates the emerging nation's reliance on the metaphors of New England Ramism. The millennial identity forged during the Awakening obviated all concern for original sovereignty in American political models. In a nation conceived as the New Jerusalem, original sovereignty resided logically in the hands of an omnipotent God. Yet the American deference to an omnipotent God bore no resemblance to the Cartesian submission to authoritarian forms. Because of their absolutist frame, French theorists could

simply transfer all sovereignty from God to the State. American theorists, on the other hand, could not make the state a political absolute since the antecedent order which underwrote its power resided in a different "place." Hence the enormous quantity of American literature between 1790 and 1815 which denounced the French Revolution with, as Miller points out, "proportionately almost nothing on its behalf."<sup>11</sup>

Likewise French moral theorists, working within an intellectual heritage defined by Cartesian logic, could trade moral bondage for intellectual freedom. But this trade-off clearly would not work for American ideologues, working within the context of a realist logic and a covenantal polity. The logical substructures of colonial thought made moral responsibility an essential ingredient in the natural order -- an ingredient which precluded the construction of provisional forms.<sup>12</sup> For this reason the mechanist constructions of militant French Deists never really made serious inroads on American thought. Although works like Ethan Allen's *Reason the Only Oracle of Man* (1784) and Elihu Palmer's *Principles of Nature* (1802) attempted to articulate an American Deism, they had little effect against the relative theological conservatism of men like Adams, Madison and Jefferson. The effects of French rationalism on American moral theory ultimately emerged in the characteristic constructs of Universalism and Unitarism

rather than in a militant Deism. But the debates between men like Chauncy, Ware, Mayhew and Channing all took place within the confines of a liberal Christian orthodoxy which the French, because of their logical orientation, could effectively ignore.<sup>13</sup>

For similar reasons, American theories of sovereignty differed markedly from those developed under the impact of Lockean constructs. Unlike English Whigs, who arrived at an ideological impasse by equating sovereignty with the empirical operations of positive law, American theorists continued to conceive of sovereignty as a logical premise which resided in God. They refused to subordinate sovereignty to the products of legislative inference. From a Ramean point of view, English political theorists simply reasoned without major premises.<sup>14</sup> But even as Newtonian physics encouraged the reduction of their own First Premise to an analogical expression of a mechanical First Cause, American ideologues, working in an intellectual tradition controlled by Ramean metaphors, maintained the antecedent logical status of sovereignty. American political models therefore described the empirical aspects of political order as an expression of proximate rather than original sovereignty. And the Ramean metaphors which supported those models ensured that the proximate sovereignty they defined would reside, not in the individual, but in the

covenanted community as it stood in relation to objective truth.

The Awakening had made the covenanted community a metaphor of the American body politic.<sup>15</sup> Puritan covenant theory did not, however, express merely an ecclesiastical extension of Lockean contractualism. Lockean contracts, like the premises of nominalist logic, operated through willed agreements and verbal conventions which offered equity and control under specific conditions. By contrast a covenant, as developed under Ramean logic, implied a rational unanimity between consenting parties who voluntarily took on a mutual obligation to strive toward a logically antecedent purpose. Moreover, a covenant presupposed a "full and fixed connection" between the consenting parties and the purpose they strove to achieve.<sup>16</sup> Thus a social covenant possessed an ontological dimension which a social contract did not. In a covenant, positive law became merely *eupraxia*, or the pragmatic means of securing a rational end. And popular sovereignty became, not a legislative tool for determining derivative rights, but the institutional means by which the transcendent community could achieve its political ends.

John Adams supplied the classic formulation of the American political covenant.<sup>17</sup> Combining the predominant concerns of the Enlightenment with the attitudes and institutions of his Ramean heritage, Adams affirmed the

antecedent sovereignty of law and then placed its administration firmly in the hands of consenting communities. Positive law, he argued, must enunciate the laws of logic and the laws of nature in order to command obedience from those who stood in covenant under it. "Laws," Adams claimed, expressed "emanations of the Divine Mind" and functioned as "silent magistrates" to administer eternal truth.<sup>18</sup> A rational appreciation of the objective order which underwrote positive law in fact represented the ultimate political virtue to Adams, a virtue which strengthened the commitment of the individual to the values of the group.

In this respect the conservative drift of Adams' political thought perfectly reflected the rational elements of America's Ramean past.<sup>19</sup> But as Edwards had clearly demonstrated, Ramean forms always harbored an alternative aspect which Adams, like a good conservative, chose largely to ignore. Accordingly, Adams political model acknowledged no role for that "emotional propulsion" which Edwards had articulated in his defense of moral agency. It reserved no objective status for individual freedom and "missed the spiritual exaltation of an immanent deity, knowable in every encounter with natural symbols."<sup>20</sup> Significantly, the "enthusiasm" implicit in Ramean models -- that spiritual autonomy against which Puritan divines had fought so hard -- entered American political models not through

the Brahmin Adams, but through the naturalist Jefferson, whose moral theories created an active role for individual freedom within the confines of antecedent communal values.

Jefferson, like Edwards, found spiritual truth adequately symbolized in the empirical facts of nature. Indeed, for Jefferson, nature itself became the receptacle and vehicle of all knowledge and value. Jefferson claimed that "facts" alone could express reality. But Jeffersonian "facts" did not reflect Cartesian "innate ideas" or Lockean "sense impressions." They expressed rather an objective reality which could be grasped as "self-evident" by the natural structures of the mind. In short, they reflected an Enlightenment variant of Ramean first premises, stated in the context of a realist ontology.

Research by Wilbur S. Howell indicates that this affinity between Jeffersonian and Ramean constructs is not accidental or contrived, but indeed derived from Jefferson's direct exposure to Ramean principles via the *Elements of Logick* of William Duncan. Howell describes the text -- found in Jefferson's library -- as a derivative Ramean treatise filtered through the Scottish Schools. Moreover, Howell points out, Jefferson's tutor at William and Mary -- who Jefferson himself claims "probably fixed the destinies of my life" -- had himself been a student under Duncan at Marischal College in Aberdeen. Thus, Howell argues, "there is every reason to suspect that, if Small fixed the

destinies of Jefferson's life, William Duncan helped to fix the destinies of the Declaration of Independence." Howell even goes so far as to argue that the rhetorical construction of Jefferson's "self-evident" truths in fact drew directly on arguments in Duncan's treatise.<sup>11</sup>

Howell's findings certainly tend to support the current argument. By placing the "Deist" and "philosophe" Jefferson under the direct influence of a Ramean logical model, Howell suggests fascinating new dimensions in the development of American political forms. But Jefferson's "Ramism" differed from that of Adams in significant ways. Unlike the Puritan Adams, the naturalist Jefferson defined the individual as a functioning member of a biological species, not as a rational member of a social group. His political science, although developed under Ramean principles, thus dealt less with the logical consistency of institutions than with the biological characteristics which underwrote them. In a sense, Jefferson collapsed Adams' essentially medieval theory of community into an Enlightenment formulation which viewed political forms as an empirical consequence rather than a rational cause of the social order.<sup>12</sup>

Jefferson's naturalist metaphors rendered man's innate capacity for communal life the mechanism whereby he controlled his environment and thereby achieved happiness. Jefferson's concept of "community" thus no longer carried

an imperative for political organization and control. Communities fulfilled the empirical promise of nature, he claimed, not the rational promise of God. Their values reflected objective structures inherent in the environment which supported them, not external systems of political administration. Accordingly the social destinies of Jefferson's communities became more than constituent elements in the political destiny of a nation. They in fact became identified with the natural destiny of the species itself.

Jefferson's subsumption of the community under the species, and his subsequent description of the species in Ramean images, led ultimately to his characteristic substitution of "happiness" for Lockean "property" as the object of pursuit in the Declaration of Independence.<sup>23</sup> Locke had grounded his right to property in a theory which generalized a private prerogative into a social right through inference. But Jefferson, under the influence of Ramean metaphors, grounded his rights in an antecedent order. Under the rules of his logic, "property," as a source of individual fulfillment, simply did not contain the logical attributes necessary for the construction of a "right." Happiness, on the other hand, could be taken to signify the material prosperity and survival of the species as a whole. It could therefore support the formulation of a right with ties to a wider purpose. By substituting "happiness" for "property" in the Declaration, Jefferson



thus declared conceptual allegiance to a logical model which could subordinate the individual to the health and prosperity of the biological group without sacrificing his personal worth. Jefferson still celebrated property, but in a manner vastly different from the legal-minded English Whigs or the French physiocrats. The right to property survived in his agrarian model as a vehicle for advancing the happiness of the species, not for gratifying individuals.

Jefferson's naturalistic morality, held in tension with John Adams' characteristic rationality, perpetuated the dialectical structures of American political life. Jefferson placed more emphasis on the processes of moral behavior than on the content of moral law. Indeed his contention that the relationship of every individual to the species by birth provided the best proof of the original and natural equality of all men precluded any concern with equality as a moral absolute. Like a good Ramean, Jefferson acknowledged the logical antecedence of moral laws. But he interpreted those laws as a framework of opportunity for the development of the species, not as a framework of authority for governing the community.

Thus although Jefferson's biological definition of community implied an informing ideal of the common good, his naturalistic "means" of government left the moral "ends" of his political philosophy vaguely implicit in nature.

Indeed, while both Jefferson and Adams maintained the priority of common purpose at the center of their political models, they approached that purpose from two radically different perspectives -- perspectives which in fact reflect the dichotomous elements of their Ramian heritage. In a sense, while Adams argued for the virtues of *technologia*, Jefferson argued for those of *eupraxia*. Together they constituted a complete Ramist!

The dialectical structures established at the base of American political life by Adams and Jefferson emerged full force in the "enlightened realism" of James Madison, who, like the Constitution he fathered, worked to maintain a dynamic balance between these conflicting ideological impulses.<sup>24</sup> Madison drew heavily on the works of Scottish Enlightenment thinkers in the construction of his political model. He received his grounding in Scottish thought under John Witherspoon who "had recently come from Scotland where he had been immersed in its intellectual and public life." Witherspoon put "all the leading Scottish authors...on his reading lists" where Madison found them in 1768 and absorbed their realist orientation.<sup>25</sup>

Chief among Madison's sources was Thomas Reid, who like Jefferson's tutor Small, studied under William Duncan at Marischal College. Reid's *Brief Account of Aristotle's Logic* (1773) contained numerous references to Ramus, calling him at one point a reformer "who had a force of genius

sufficient to shake the Aristotelian fabric in many parts." Reid argued for a Ramist model of cognition which operated through "an instinctive prescience of the operations of nature." Inquiry, he claimed, depended for its validity on "a fixed and steady course of nature" which man could anticipate through the natural structures of his mind.<sup>26</sup> While Reid's logic hardly qualifies as an overtly Ramist text, it nonetheless perpetuated some crucial Ramean elements, primarily that naïve confusion between induction and hypothesis which Ong noted as the source of Ramean realism and which the Puritans had adopted as the methodological ground of their doctrine of means. It seems reasonable to assume that Madison absorbed at least a portion of Reid's Ramean bias.

In fact, Madison's "enlightened realism" can be seen as a political variant of a Ramean logical paradigm, transmitted to him primarily through Reid. Madison constructed a political model which viewed societal change as a developmental process driven by a dialectical exchange between man and his social environment. Unlike Adams and Jefferson, Madison refused to celebrate America as the ideal embodiment of either a natural or a political Eden. Instead he built on the developmental concepts expounded by the Scots in their "four stages theory" to construct a political model which celebrated the potential of America.<sup>27</sup>

The "four stages" theory, developed by Smith, Ferguson and Millar, described social change in rudimentary evolutionary terms. Madison followed Ferguson in placing great value on ongoing human relationships within a society. He could therefore, unlike Jefferson, appreciate the contributions of succeeding generations to the process of societal change. Moreover, by adapting the discussions of Smith and Millar on the origins of property to a broader political perspective, Madison could further argue that laws in fact reflected a social consensus evolved over time in response to changing conditions. This in turn led him to formulate a cumulative legal model which, unlike English common law theory, acknowledged society's ability to change and advance within the context of transcendent political forms.

Furthermore, the dialectical exchange between man and his environment which dominated Madison's political model gave it the unique ability to accommodate factional interests as legitimate features of political order -- something which neither Adams' rationalism nor Jeffersons' naturalism could ever do.<sup>20</sup> But Madison modified the Scottish defense of faction in significant ways. In fact, he brought the Scottish theories more explicitly under the operation of Ramean metaphors by translating them into the characteristic language of covenantal theory. By portraying political factions as voluntary associations intersecting across traditional forms of association, Madison in effect

cast the legitimating mantel of the external covenant over the field of private interests.

Indeed Madison's ideal of America as "the workshop of liberty" clearly expressed a political version of Ramist *eupraxia*. It portrayed the nation as a logical nexus in which practical means would work to realize transcendent ends. By tying the pursuit of goods and knowledge to the fulfillment of the nation's wider purpose, Madison gave a vital impetus to the developing commercial and economic life of the new nation. Coincidentally he perpetuated the dialectical structures which lay at the base of American thought. Drawing on a native Ramean tradition reenforced by the Scots, he set the new nation on a realist course from which it would not substantially deviate for the next hundred years.

The Constitution, for whose final form Madison was chiefly responsible, defined the institutional means by which the dialectical impulses of American political life could be maintained in equilibrium. In a sense, the Constitution did for American politics what Edwards had done for the Awakening and Ramus had done for the Citty -- it furnished a realist ground for the constructive interaction of conflicting ideological drives without sacrificing the energizing ideals behind them. The Constitution explicitly defined the moral ends of the national government (*technologia*), while providing a pragmatic means for the

implementation of political power (*eupraxia*). As such it offered a corrective for Jefferson's unwillingness to give rational form to his biological community, while supplying Adams with a vehicle for bringing his rational community under a viable political order. Put simply, the Constitution outlined a set of methodological postulates for controlling the political discourse of the nation.

In the present context, it is interesting to note that the primary sources of American constitutionalism are in fact German, not French or English. Morton White points out that in spite of a nominal homage paid to Locke, "the framers of the Declaration and the Constitution never use his reasoning in what is probably the most powerful piece of political and moral writing that Locke ever influenced."<sup>29</sup> Likewise Michael Durey claims that "Sidney was mentioned only rarely, and then usually in a general litany of heroic names," while John Werner points out that Revolutionary leaders "execrated Hume's work" and "had no use for the man."<sup>30</sup> Similarly, the patriots' rejection of French political models was both patent and outspoken. In fact, those political models on which American theorists relied most heavily were Rhenish models developed under the operation of a Ramean logical tradition. In political theorists like Althusius, Vattel, Pufendorf and Burlamaqui, who Conkin claims were "all celebrated in America," American ideologues found models much more compatible with

their own intellectual heritage than those of Locke or Montesquieu.<sup>31</sup>

Indeed Althusius propounded theories of sovereignty and consent which Conkin claims to be "almost indistinguishable from those of the Puritan leaders in New England." Likewise Vattel, a disciple of Christian Wolff who developed theories which tied popular sovereignty to communal consent, exerted his strongest influence "not in Europe, but in America," where he provided Adams with a Ramean perspective on the ancient respect for tacit consent grounded in custom and compact.<sup>32</sup> Pufendorf supplied not only John Adams, but John Wise before him, with a Ramean justification for the objective grounding of moral law. Miller claims, in fact, that whole paragraphs of Wise's *Vindication* "turn out to be paraphrases of Samuel Pufendorf's *De jure Naturae et Gentium*."<sup>33</sup> And Burlamaqui, who rewrote Hobbes in a Ramean context, exerted a strong influence on Jefferson's formulation of moral science as a derivative of antecedent forms. The present argument suggests that all these Rhenish models found a philosophic home in America due to a shared Ramean heritage.

The Constitution itself presented a Ramist argument. It predicated no theoretical construct, formulated no amorphous rights, propounded no abstract principles. It simply "invented" and "disposed" of logical "arguments" in a composite proposition. Its Preamble invented a major premise

whose arguments its subsequent Articles disposed into appropriate *loci*. In fact its entire structure can be described as a huge composite statement in the "if-then" mode. If "we the people do ordain and establish a more perfect union," then the following conditions must apply. Edwards would have called the "full and fixed connection" which pertains an historical one.

Replacing Holy Writ with popular sovereignty as the guarantor of truth, the Constitution simply declared an antecedent disposition of objective political powers and duties as the inviolable order within which the "perfect Union" would hereafter function. The Framers had no need to define the theoretical form which their government would take. Under the operation of their logic, they needed only to "invent" it -- that is, to lay open to view that logical *locus* which contained its predicates and then dispose the arguments found therein. The subsequent Articles accomplished this by locating the various powers and prerogatives of government in their appropriate places.

Political powers in fact subsisted in the Constitution's Preamble and were methodically "vested" in particular "places" by the ensuing Articles. Article I located the legislative powers while Article II disposed the executive; Article III, in a crucial move, placed judgement -- the second half of Ramean method -- in a separate judicial "place;" Article IV articulated the Ramean Law of Justice



by guarding against overlapping jurisdictions; Article V endorsed hypothesis by allowing for tentative interpretations known as "amendments;" and Articles VI and VII sealed the covenant. Significantly, however, by placing the major premise of the Constitution in its Preamble, the Framers effectively precluded the possibility of its revision under Article V. The "union" thus ordained supplied the minimal and universal conditions for human happiness and would admit of no revision.<sup>34</sup>

The Ramean structure of the Constitution significantly militated against the inclusion of "rights" among its Articles. Individual rights -- "the blessings of liberty" -- subsisted as part of the major premise expressed in the Preamble. They therefore underwrote the logical *loci* which contained the powers of government but had no "place" in the disposition of terms. This was essentially the stand taken by James Wilson in his *Defense of the Constitution* (1787) and by Alexander Hamilton in the *Federalist* #84 (1788). Wilson argued that a Constitution must operate on the logical premise that it would ensure the welfare of the whole people, not protect the rights of a few. Hamilton agreed, noting that, from this perspective, the Preamble expressed "a better recognition of popular rights than volumes of those aphorisms which make the principle figure in...bills of right, and which would sound much better in a treatise of ethics than in a constitution of government."

In a sense, both Wilson and Hamilton argued that there was "no place" for inferred rights in the Constitution. Under Ramean logic, inferred rights such as those defended in Lockean constructs remained irrelevant to logical law and therefore had to reside outside the antecedent constitution of powers. Addenda might be so constructed as to remove specific governmental prerogatives from a given *locus*, thereby ensuring individual freedom within a certain sphere. But "rights" *per se* could never function as an justification for the disposition of powers.<sup>35</sup> The isolation of rights outside the main body of the U. S. Constitution has been claimed as its most distinctive feature, clearly marking it off from its French and English counterparts. The foregoing argument suggests that this characteristic form derived directly from the Ramean metaphors which supported American political ideology.

The logical exclusion of rights from the formal constitution of powers in America proved crucial to political debates relating to sovereignty and suffrage in the 19th Century. The political pressures brought to bear by increased immigration and rapid internal expansion early in the Century rendered the careful balance achieved through Madison's realist policies increasingly precarious.<sup>36</sup> The decades of the 1820's and 1830's witnessed the disruption of familiar patterns of settlement. The influx of immigrants from widely diverse cultural backgrounds, along

with consequent demographic shifts from urban to rural districts, tended to increase factional pressures while weakening the force of covenantal logic. This in turn clouded the political issues of sovereignty and suffrage.

The problem of suffrage proved particularly intransigent to American ideologues. The franchise had never been addressed explicitly in the Constitution. "We the people," stated as an irreducible logical premise, had never been scrutinized for its logical content. Moreover, as an argument "invented" in the Preamble, "We the people" stood definitively outside those powers disposed in the Articles, among them the power of amendment. This logical idiosyncrasy militated against addressing the issue of suffrage on a national level. In fact the logical form of the Constitution ensured that issues of suffrage would be addressed at the state level until such time as the rights of the states to legislate on such questions collapsed into the wider issues of the Civil War.<sup>37</sup>

Since, in effect, the franchise had no "place" in the Constitution it could not be "relocated" among its Articles. Yet the social realities of a burgeoning nation demanded that the government clarify its constitutive premise and adjust its legislative formulas to accommodate expanding perspectives. The theoretical challenge lay in finding a means to define the social substance of the Constitution's major premise without impugning the integrity

of its logical argument. The Jacksonian Democrats claimed to have a political program which could accomplish the first. The question remained whether they could do so without sacrificing the unique covenantal character of American political life.

Jacksonian democracy can best be understood as an exploration of the political issues raised by the logical exclusion of the right of suffrage from the U. S. Constitution. The populist program sought simply to clarify the logical ground of American political power by defining that anomolous community which had occupied the conceptual center of Adams' and Jefferson's political thought. To accomplish this, the Democrats merely carried the political implications of Jeffersonian naturalism out to their logical conclusion. They conceived of the political community as an aggregate of private interests underwritten by cohesion rather than by a vague rational or biological unity.<sup>30</sup> In a sense, they atomized the rational and biological communities of Adams and Jefferson and reassembled them, following Madison, under concrete principles of association rather than abstract principles of obligation. Under populist theory, "We the people" became a community of discrete individuals driven by private interests to maintain social order through the imposition of political forms.

Had this definition of community expressed the entire content of the Democrats' political program, however, they

would rapidly have found themselves in possession of a failed ideology. Clearly such a Hobbesean view, while appropriate to Whig theories developed under an inferential logic, could not survive in a political atmosphere fed by the philosophic currents of Ramism. But the Jacksonian's concept of the individual in fact rested on a logical foundation not unlike that which had supported Adams' and Jefferson's own concepts of community. Indeed the voluntary principle which animated populist thought expressed a firm belief in a pervasive and fundamental order which, left to its own devices, would manifest itself through society.

This belief in an antecedent order allowed the Democrats to formulate their platform in terms amenable to the nation's political past. Moreover, this faith in what John Ward calls a "cosmic constitutionalism" led the populists by implication to the two logical axioms which controlled their political program: first, that the natural order of society subsisted apart from its institutions; and second, that political intervention in fact contaminated rather than preserved the natural order.<sup>39</sup> These two axioms combined to generate a characteristic negative theory of government which in turn provided the Democrats with the logical mechanism they needed to address the issue of suffrage at the Constitutional level.

Under the populists' negative theory, "the blessings of liberty" invented in the Constitution's Preamble signified

merely a lack of intervention in the interactions of individuals whose fundamental equality before the law derived from an irreducible logical premise. Under this curious inversion of a political covenant, the right of suffrage could be treated as a political privilege acquired through the negation of political powers.<sup>40</sup> Accordingly, arguments for suffrage could take the form of propositions which removed specific prerogatives from logical *loci* and, by negation, relocated them as rights outside the constituted powers of government. The realist ontology which lay at the base of the Democrats' political theory allowed them to justify logical negation as a means of preserving the antecedent natural order of society. Thus they could forge a viable analytical link between political powers and individual rights while remaining within the methodological structures of the Constitution.

While ultimately Jackson's own devotion to his party's ideology proved suspect in the light of his aggressive use of executive power, the logical formulation of that ideology remains significant in the present context. For the Jacksonians articulated their negative theory of government in the key words "natural" and "artificial" -- terms which had likewise underwritten the theoretical constructs of New England Ramists, as well as those of Edwards, Adams and Jefferson. In a characteristic statement one Jacksonian spokesman claimed that the "natural" charter of privilege

which existed among individuals could be threatened only by the institution of "artificial" advantages through legislative charters. "Once man was freed from the 'artificial institutions' of society, he would 'walk abroad through the free creation'."<sup>41</sup> Thus, in a curious rhetorical concurrence, the Jacksonians in fact propounded a political argument almost identical to the logical argument which Ramus had brought against the Aristotelians -- an argument which rested on the commentitious nature of the artificial restraints which men imposed on the natural structures of the mind.

The increasing complexity of American life in the mid-19th Century, however, quickly debased the Populists' political ideal. Rapid expansion of the industrial and commercial life of the nation drastically reduced the sphere reserved for independent action. Moreover, the practical exigencies of conserving order on a continental scale encouraged an implementation of government controls which belied the Democrats avowed intentions. Yet although the Jacksonians' platform became less and less relevant to the political realities of the nation, the die was cast. The formidable forces of populism, previously contained within the limits of strict constructionism, gained legitimacy under the banner of the Democrats' logical negations and threatened to unbalance the delicate dialectical mechanisms of the Constitution. Henceforth they would

remain a permanent feature of American political life. In reaction, those alarmed over the political consequences searched their intellectual heritage for a means to neutralize the impact. They found an appropriate defense in an interpretation of law drawn directly from the Ramist structure of the Constitution itself.

The Constitution's Preamble had expressed the major premise of a political proposition. Articles I and II had disposed the arguments of that proposition across various political *loci*. Article III, on the other hand, differed radically from the first two. Rather than disposing of political powers, it created an independent logical "place" in which it "vested" the crucial mechanism of judgement.<sup>42</sup> By placing the controlling process of judgement in an independent logical *locus*, Article III in fact created a judicial "place" wherein resided those dialectical tools necessary for maintaining methodological control over the centripetal forces of popular democracy. Under the rules of Ramean logic, which identified the operation of law with the application of method, Article III in effect entrusted the antecedent logical structure of the nation to the Courts.

Ramus had placed judgement in control of the second and probative half of method. In the present context it is interesting to note that one of the major differences which pertained between Baconian and Ramean logic lay in Bacon's



extension of judgement across the entire field of discourse. Where Ramus had restricted the application of method to the disposition of terms, Bacon invoked it as a controlling principle in predication as well. Baconian logic would thus have represented the logical premise of the Constitution as susceptible of revision, as was the case under English Parliamentary forms. Ramean logic, on the other hand, rendered this impossible. Although the process of judgement -- i.e. the operation of the courts -- could adjust and reinterpret the disposition of political terms, the logical structure of the Constitution itself militated against intervention in its major premise. Therefore, although specific laws could be declared "unconstitutional," the Constitution itself could not be declared invalid. This fundamental legal issue, clearly grounded in a Ramean ontology, provided justification for Northern conservatives during the Civil War. The Union, Lincoln claimed, could not logically be dissolved. It had been invented as an irreducible logical premise grounded in objective truth and was therefore inviolable.

Article III in fact appointed the judiciary branch guardian of the national covenant. It created a special category of law which cast the Supreme Court in the role of that "inner monitor" on which New England Ramists had relied to adjudicate their disjunctive statements. Judicial review in effect furnished a mechanism for submitting

particular manifestations of the popular will to the test of logic. The process of judgement -- i. e. the application of method -- allowed the Court to monitor the practical means by which factional interests achieved their political ends. Moreover, by making the judiciary an independent arbiter over the disposition of the Constitution's logical terms, Article III ensured that any subsequent relocation of those terms through amendment would not encroach on the minimal and universal conditions for political happiness set forth in the Preamble.<sup>43</sup> Thus by authorizing the application of method to the composite form of the Constitution, Article III guaranteed the stability of a political model increasingly plagued by internal and external forces for change.<sup>44</sup>

The Supreme Court embodied a unique dialectical tool for controlling the political discourse of the nation. It allowed American legal theorists to adjust a transcendent national ideology to the present needs of a social environment where change exerted too obvious a force for revision to be ignored by any viable political construct. Early in the life of the new nation legal philosophers like Madison and Wilson had recognized the necessity of incorporating processive theories drawn from Scottish sources like Smith and Millar into the fabric of American judicial thought.<sup>45</sup> Following the logic of their argument, and responding to increasing pressures from disruptive debates over

sovereignty and suffrage, Justices like James Kent and Joseph Story moved gradually toward a reevaluation of Jefferson's wholesale rejection of common law, seeing in its cumulative processes a means for incorporating the changing realities of American life into a characteristic body of American law.<sup>46</sup> Since the structure of the Constitution precluded the possibility of common law principles usurping the logical antecedence of the national covenant, American jurists could safely adapt the common law's reliance on historical precedent to American needs, thereby providing a legal rationale for judicial response to societal change.

Under the determining influence of its early Justices the American judiciary fulfilled its Ramist role as the arbiter of the nation's political conscience. Through a legal dialectic which measured societal change against the standard of a transcendent ideal, the Court brought American legal philosophy into conformity with the objective realities of American life. Indeed the characteristic ability of Ramean forms to bring the contingent effects of social experience under the operation of an antecedent order allowed American jurists to elevate the mores of the community into a moral absolute.<sup>47</sup> Emerging ultimately in the legal pragmatism of men like Holmes and Brandeis, the realist metaphors which controlled American law in fact allowed for the development of characteristic principles of order which, like New England's early Ramists, interpreted

law as a rule for action. Moreover, the unique ability of Ramean metaphors to incorporate principles of development and change into fundamental logical structures prepared American legal models to absorb the intellectual shocks which the second half of the 19th Century held in store. By viewing change as a refinement of structure, American jurists could adapt evolutionary models to characteristic American conceptions of order without impugning the logical integrity of their national ideal.<sup>48</sup>

Newtonian paradigms had supported traditional natural-law reasoning. But Darwinian theory would demand a different formulation of law. As Darwinian theory gradually began to displace mechanistic models in the mid-19th Century, American jurists identified in it a scientific analogy which they could accept. Evolutionary theory placed mechanical constructs in a temporal frame. Yet it lent a certain permanence and constancy to the contingent world by viewing change as development. As such it took an intermediate position between mechanism and teleology curiously congruent to Ramean models. Indeed, even before the introduction of fully developed evolutionary theories in the second half of the 19th Century, Miller marvels, at how American legal models "often hovered on the very edge of an evolutionary philosophy [and] approached an insight into the organic."<sup>49</sup> The present argument would contend

that this flirtation with evolutionary forms drew directly on the metaphors which underwrote Ramean constructs.

The political adjustments which followed in the wake of the Civil War brought the logic of law full circle in America. The clarification of the political issues of sovereignty and suffrage accomplished through Constitutional responses to the national trauma encouraged a sense of closure to the search for principles of order. The major premise of the Constitution had been defended with the nation's blood. Henceforth the Union would stand "indivisible" as the political manifestation of that irreducible premise. Although the application of judicial review would continue to increase the structural density of American law, the antecedent order had been secured.

Indeed the major social and political constructs developed immediately after the Civil War, generally grouped under the rubric "Social Darwinism," in fact all operated within Constitutional boundaries. Herbert Spencer, whose cosmic theory outlined a process by which a self-regulating nature moved from incoherence toward an equilibrium underwritten by a perfect order, was the primary source of these models. William Graham Sumner drew on Spencer's principles of laissez-faire capitalism to argue for a unique amalgam of Jefferson's naturalism and Jackson's negativism. According to Sumner an activist state not only denied biological fact. It presented a posi-

tive deterrent to progress. Thorsten Veblen, on the other hand, turned Spencerian doctrine on its head to develop a *Theory of the Leisure Class* which clearly reached back to Madison's Ramist image of the "workshop". John Fiske followed Jefferson in his attempt to interpret Darwinian theory at the level of the species. The struggle for survival, he claimed, supplied a biological warrant for cooperation and solidarity within the species. Lester Ward developed this moralistic view into a full-blown social ideology. Drawing on those somatic impulses incorporated into American thought by Edwards, he propounded a theory of "collective telesis" which gave biological substance to the social community which underwrote all American political thought.

All these different interpretations of change, however, operated within an antecedent frame which expressed a rational end. They could thereby change the face of American society without impugning its wider purpose. The conspicuous lack of revolutionary or anarchist ideology in America at a time when these forces ran rampant in Europe attests to the force of the paradigm, which the present argument would identify as overtly Ramean.<sup>50</sup>

As the nation's political life became more assured, the intellectual energies expended in its defense could shift to related issues of scientific order which, under the impact of evolutionary theory, had become critically

unstable. The search for order in modern American would subsequently focus on the means by which the nation's dialectical metaphors could accomodate powerful new conceptions of scientific law.

### CHAPTER NOTES

1. See Clifton E. Olmsted, History of Religion in the United States (Englewood Cliffs, 1960) for a narrative of the transition. Alan Heimert agrees and characterizes the Awakening as a "national conversion experience" which transformed a theological into a social consensus Religion and the American Mind (Cambridge, 1966).

2. Edwards, Complete Works (New York, 1830), IV, 128-133.

3. "[The Revolution] was affected, not to say guided," Edmund Morgan claims, "by a set of values inherited from the [Awakening]. ...The major developments, the resistance to Great Britain, independence, the divisions among successful Revolutionists, and the formulation of policies for the new union, were all discussed and understood by men of the time in terms derived from the Puritan Ethic" ("The Puritan Ethic and the American Revolution" in McGiffert, Puritanism, 183, 187). Heimert agrees that the Awakening began a process which recast the errand in a millennial framework that accommodated the thrust toward independence (Religion). Melvin Endy presents a similar argument in "Just War, Holy War, and Millennialism in Revolutionary America," WMQ III (1985)42:3). See also Hatch, The Sacred Cause of Liberty: Republican Thought and the Millennium in Revolutionary New England (New Haven, 1977), 17-88 passim; C. L. Albanese, Sons of the Fathers: The Civil Religion of the American Revolution (Philadelphia, 1976).

4. Miller argues for a similar effect through rhetorical forms, even though "hardly any practitioner of the method had the slightest memory of Petrus Ramus, of Omer Talon, or of the host who instructed the first Puritans. ...The consequence of their 17th Century discipline remained with them long after the tuition faded, and in the language of Revolutionary ardor...spokesmen of the Revolution conveyed the plain style into the extending vistas of American self-expression" (Perry Miller, Nature's Nation (Cambridge, 1967), 216). Although he fails to tie his discussion specifically to Ramism, Kammen also notes that 17th Century Puritans bequeathed to the revolutionary era a "political style, a way of doing and viewing public affairs" (Paradox, 165). See also Bercovitch, Origins, 149-161.

5. Daniel Boorstin, "The Puritans: From Providence to Pride" in McGiffert, Puritanism, 105; Genius, 9, 23-24.

6. See Paul Conkin, Self-Evident Truths (Bloomington,



1974).

7. Ibid., x.

8. Ruth Bogin gives an interesting interpretation of this aspect of American law in her discussion of "Petitioning and the New Moral Economy of Post-Revolutionary America," where she argues that the right of petition in fact represented an opportunity for individuals to complain of particular wrongs without impugning the wider integrity of the law itself (WMQ III 45 (1988):390-425).

9. Ralph Barton Perry argues that it is this which makes American political life unique. The difference, he claims, without explicitly tying his argument to logical substructures, "lies in the conception of nature" (Puritanism, 421). The present argument would offer Ramean constructs as the explanatory principle.

10. Lester H. Cohen, "The American Revolution and Natural Law Theory," JHI 39 (1978):492.

11. Perry Miller, Life of the Mind in America: From the Revolution to the Civil War (New York, 1965), 4.

12. What horrified Adams about the French Revolution was that the French denied any objective moral reference or antecedent natural order in their political formulations. They erected the individual himself into a moral absolute and thereby opened the door to anarchic irrationalism (See Discourses on Davila). Adrienne Koch points out that "only in the American Enlightenment had liberty not been opposed to equality, but the double and complementary values of both had been publicly affirmed. Men like Jefferson, Madison and John Adams...while they staunchly defended the principle of majority rule...did not make a mystique of the unitary will of the nation out of it" (Power, Morals and the Founding Fathers (Ithaca, 1961), 43).

13. Likewise the extreme environmentalism of men like Montesquieu and Buffon resisted subsumption under Ramean metaphors. Hence what Joyce Appleby calls Jefferson's "unabated desire" to combat the influence of Montesquieu and his school ("What Is Still American in the Political Philosophy of Thomas Jefferson," WMQ III 39 (1982):287-309).

14. Edmund Morgan comments on the lack of objective or transcendent principles in English interpretations of Locke (Puritan, xli), while Morton White points out that "Locke taught American philosophers how to talk, [but] not always how to think" (Science and Sentiment in America (New York, 1972), 11). It is also interesting to note, in the

present context, that the English word "right" is not equivalent to the French word "droit" or the German word "recht". The French and German counterparts refer to rights as a body of basic principles underlying the positive law. The English word carries no such implication but refers rather to rights as claims justified (or inferred) under certain circumstances. But what, Alexander Hamilton demanded in a remarkably clear application of Ramist *technologia* and *eupraxia*, "is...the great body of common law [but] natural law and natural reason applied to the purposes of society?" ("Speech in the Case of Harry Crosswell" in H. C. Lodge, ed, Works of Alexander Hamilton (Boston, 1904), VIII, 421). Jefferson shared this aversion to common law principles, an aversion which reflected a conscious commitment on the part of American ideologues to maintain objective constructs in their legal theory and not to subordinate original sovereignty to the operation of inference.

15. Miller claims that the covenant became "the theoretical foundation of the state" (Mind, 399). H. R. Niebuhr describes it as an ordering principle which extended itself to the societal "macrocosm" ("The Idea of the Covenant and American Democracy" in McGiffert, Puritanism, 219-225). For discussions of the covenant as a force for conservatism see Perry, Puritanism, 365; Labaree, Conservatism; Ronald Lora, Conservative Minds in America (Westport, 1979); Lance Banning, "Jeffersonian Ideology Revisited: Liberal and Classical Ideas in the New American Republic" WMQ III 43 (1986):3-19; J. A. Sigler, Conservative Tradition in American Thought (New York, 1969).

16. "In a covenant," Miller points out, a man "is infinitely more liable than in a promise, more obligated than by a law, more involved than in a testament, more answerable than for his oath. An oath may attest a mistake, but a covenant guarantees truth. A promise calls for some future good, a law for some performance, but a covenant calls for both" (Mind, 375). Niebuhr agrees. "Contract always implies limited, covenant unlimited commitment; contract is entered into for the sake of mutual advantages; covenant implies the presence of a cause to which all advantages may need to be sacrificed" (McGiffert, Puritanism, 224). Michael Walzer develops the differences between covenant and contract in a Marxist vein in "Puritanism as a Revolutionary Ideology" in Katz, Perspectives, 3-35.

17. "The body politic is...a social compact, by which the whole people covenants with each citizen, and each citizen with the whole people, that all shall be governed by certain laws for the common good" (Preamble to the Massachusetts Constitution).

18. C. F. Adams, ed. The Works of John Adams (Boston, 1850-1856) VI, 56.

19. Conkin, Truths, 118-121. Ironically Adams arrived at his essentially conservative politics through a liberal theology. He grew up a liberal Congregationalist in a fellowship which was one of the first to move toward Unitarianism. Educated at Harvard after the champions of orthodoxy had run off to establish Yale, Adams' essentially rational interpretation of sovereignty in fact rested squarely on a moralistic interpretation of Christianity grounded in the Universalist/Unitarian tradition. Hence for Adams Christianity itself had a rational and moral rather than a doctrinal connotation. Conkin claims that the spiritual power of Jonathan Edwards, whom Adams nonetheless read faithfully, "never made any real sense [to him] except in an impossibly literal sense."

20. *Ibid.*, 116.

21. For a discussion of Duncan's logic which ties it directly to Ramean disposition and method, see Howell's chapter "The Declaration of Independence and 18th Century Logic" in Poetics, Rhetoric and Logic, 163-190.

22. This logical reduction of the concept of community emerged clearly in Jefferson's theory of the sovereignty of the present generation, which argued that government had to represent the will of the living majority. In a political construct which brought him into direct conflict with all common law theories, Jefferson claimed that no generation owed allegiance to the political constructs of its predecessors. See A. E. Bergh, ed., Writings of Thomas Jefferson (Washington, D. C., 1907), VII, 455-460; XIII, 272-357.

23. For a discussion of what he calls Jefferson's "demotion of property from a natural to a social right, see David M. Post, "Jeffersonian Revisions of Locke", JHI 47 (1986):147-157.

24. Adrienne Koch labels Madison an "enlightened realist" and comments that "without benefit of Freud or Pareto, [he] found it possible to establish a realistic position on human nature as the center of his political theory" (Power, 115,113). Koch does not, however, tie Madison's political realism to a logical base. The present study would, of course, argue that it derived directly from the Ramean substructures of his thought.

25. Roy Branson, "James Madison and the Scottish Enlightenment," JHI 40 (1979):235-250). Howell presents a convincing argument for the Ramist foundations of 17th and

18th Century Scottish thought. "St. Andrews appears to have been the first center of Ramism in the British Isles," he claims, pointing out that McIlmaine was in residence there when he first introduced Ramists texts. Moreover, Andrew Melville, one of the first British educators to support a Ramist curriculum, did so at the University of Glasgow. Howell adds that the dedication of Foclin's *Rhetorique* to Mary Queen of Scots and the support of James Stewart, who had once studied under Ramus at the Collège de Presle both ensured that Ramism would attain a special prestige in Scottish Universities (*Rhetoric*, 188-189). To this argument Ong adds a convincing link between Ramist dialectic and the development of John Wesley's thought, claiming in fact that Methodism itself carried a Ramist label ("Naming of Methodism...").

26. Thomas Reid, *An Inquiry into the Human Mind* (1765) in *Works of Thomas Reid* (Edinburgh, 1863), 199. For a discussion of Reid's logic see Howell, *18th Century*, 371-431 and Gilson, *Modern Philosophy*, 293-298. For structural elements in Reid's thought see Cantor, "Berkeley, Reid and Optics...", 443-447. For a discussion of Reid in the context of scientific methodology see Laudan, "Thomas Reid...", in Butts and Davis, *Heritage*, 104-131.

27. For a discussion of the four stages theory as developed by Smith and Millar see Paul Bowles "The Origin of Property and the Development of Scottish Historical Science," *JHI* 46 (1985):197-209. For a discussion of the Scottish Enlightenment in a political context, see Gladys Bryson, *Man and Society: The Scottish Inquiry of the 18th Century* (New York, 1968). In the present context, it is interesting to note that both Howell and Ong tie the work of Adam Smith directly to Ramean paradigms (see Howell, *Logic*, 562-576; Ong, *Rhetoric*, 216-227)).

28. Branson points out that "Madison was able to synthesize the...rationalistic understanding of contractual majorities dominating governmental action with the Scottish historical-developmental view of society full of active occupational, political and commercial groups achieving moderate reforms" ("James Madison...", 250).

29. White, *Science and Sentiment*, 70.

30. Michael Dury, "Thomas Paine's Apostles: Radical Emigrés and the Triumph of Jeffersonian Republicanism," *WMQ* III 44 (1987):661-688; John Werner, "David Hume and America," *JHI* 33 (1972):439-456.

31. Conkin, *Truths*, 100.

32. *Ibid.*, 17, 26. Emmerrich de Vattel, a Swiss jur-

ist who argued for "unamendable principles of right reason" which transcended one's obligation to the state, produced an acknowledged popularization of the *Jus gentium* of Christian Wolff (*Les droits de gens* (1758)) which exerted a considerable influence in America.

33. Miller, Colony, 295. Samuel Pufendorf was a German jurist who received his education at Leipzig and Halle and pursued his scholarship at Heidelberg -- all centers of Ramism via Wolff. His *De jure naturae et gentium* (1672), which confirmed moral principles as logically grounded in objective truth, was frequently and respectfully invoked by John Adams in his *Novanglus* and his *Defense*.

34. Eventually, it was this logical construction which was called on to justify the Civil War.

35. It is interesting to note that each of the Amendments which composed the original Bill of Rights expressed a negation -- that is, it removed a specific power from a logical *locus*. The single exception is the 6th Amendment, which dealt rather with the method of judgement, not the disposition of terms. But this Amendment has its own significance with relation to Ramean constructs (see below, note 43).

36. For a brief summary of the disruptive tensions at work in American society in the early 19th Century, see "The Tensions of an Expanding Society" in Handlin, Americans, 238-255 and Hofstadter, America at 1750.

37. In the present context, it is interesting to note the similarities which pertain between the issues raised by populists in the debates over suffrage and the issues raised by Puritan divines in the debates over the Half-Way Covenant. These controversies, occurring a century apart, both addressed similar conceptual crises. And, significantly, they were resolved through a similar application of logic. See above, note #.

38. John William Ward argues that Jacksonian thought sought "to abolish the distinction between government and society, to deny the problem of politics by refusing to define a general interest at all" ("Jacksonian Democratic Thought: A Natural Charter of Privilege," in Cohen et al., eds., The Development of American Culture (New Jersey, 1971)). In an apparently inadvertent use of logical terms here, Ward has struck on what this study would argue was the central impulse of Jacksonian thought -- to redefine the logical premise of the Constitution as the individual, not the community. The best source for contemporary statements of Jacksonian ideology is *The United States Magazine*

and *Democratic Review*, begun in January 1838.

39. Ward, "Jacksonian Thought...", 60.

40. The XIVth Amendment itself expressed a negation of governmental power rather than a positive affirmation of rights. Under the logical construction of the Constitution this was, in fact, the only way in which such a proposition could be incorporated into the document without revision of its fundamental premise.

41. Ibid., 56-57.

42. Significantly, the only amendment among those constituting the Bill of Rights which *did not* express a negation was in fact the sixth, which established the positive rights of individuals before the law. Under Ramean logic, ensuring the individual's access to the crucial process of judgement was adequate to secure his rights.

43. Not all scholars would agree. Conkin, for instance, argues that the Court's claim to "the primary responsibility for constitutional review...marked an unwritten accretion to our constitution that rivaled in importance the development of a two-party system. ...In no sense," he claims, "did popular sovereignty mandate the degree of later constitutional deference paid to the Supreme Court" (*Truths*, 67). Under the present argument, however, it would seem that both the two party system and the concept of judicial review were in fact natural derivatives of the Ramean structures which underwrote American political discourse. This becomes apparent when the peculiarly American doctrine of popular sovereignty, based in a covenantal heritage, is distinguished from its French and English counterparts, neither of which could have supported a similar construction of judicial prerogative.

44. It was in precisely these terms which Hamilton defended the role of the judiciary. According to Hamilton, the process of judicial review upheld the traditional wisdom of the people as expressed in their most solemn covenant, the Constitution. In this sense, the least democratic branch of the government became the prime defender of the people's ultimate sovereignty. See Hamilton's argument in Clinton Rossiter, *The Federalist Papers* (New York, 1961), 470.

45. Smith's *Lectures on Jurisprudence* (1762-1763) and Millar's *Of the Origin of the Distinction of Ranks* (1771) were the major sources. The Ramean orientation of Wilson's work emerges clearly in his argument that constitutive law must reflect the objective order of the society it seeks to control. The law is immutable, he claimed, only because it

has its roots in the nature, constitution and objective relations of things. Since the nature and constitution of American society so clearly encompassed elements of development and change, American law must become "progressive in its operations and effects" (*Of the General Principles of Law and Obligation* in R. G. McCloskey, ed. The Works of James Wilson (Cambridge, 1967), 97-125). The Ramist structure of the Constitution allowed for the kind of revision called for by Wilson while still maintaining the immutable character of an antecedent moral law. For a discussion of Wilson's influence on American legal theory, see Cohen, "American Revolution...".

46. For discussions of Kent's and Story's role in adapting the common law to American needs through their Commentaries, see Miller, "The Legal Mentality" in Life, 207-254. For sharply focused discussions of their respective legal philosophies see G. Edward White, The American Judicial Tradition (New York, 1976). For a specific discussion of Kent's arguments on suffrage see Sigler, Conservative Tradition, 115-120.

47. For discussions of legal pragmatism see Stow Persons, American Minds (New York, 1975); Paul Conkin, Puritans and Pragmatists (Bloomington, 1976); Perry Miller, American Thought: From the Civil War to W. W. I (New York, 1954), 183-212, 331-345. Daniel Boorstin traces the roots of American legal pragmatism back to Jefferson's naturalistic morality (Lost World, 237-248).

48. In the present context, it is interesting to note in passing Grimké's application of the Newtonian model to his campaign for codification in the early 19th Century. Miller claims this campaign reflected a dispute "over the identity of the nation" (Life, 254). Simple codification could not accomodate the logical impulses behind American law, which was committed rather to merging particular decisions with an antecedent order.

49. Ibid., 128-129.

50. For a generally accessible discussion of Social Darwinism in American Thought, see Richard Hofstadter (New York, 1965). See also Miller, Thought.

Chapter 8  
BACON AND RAMUS:  
The Logic of Science  
in  
America —

"The Age of Modern Science," Stow Persons notes, "coincides with the span of American history."<sup>1</sup> And in fact, the concurrence of revolutionary scientific advance with the formulation of American thought has had a determining impact on the disposition and thrust of American values. Morton White has gone so far as to claim that the entire history of American philosophy "may be represented by a cyclical curve depicting the fortunes of science."<sup>2</sup> The argument presented in Chapter VI tends to support that claim. Furthermore, it suggests, as does White, that the interactions between logical and scientific metaphors might prove even more decisive in the New World than in the Old.

Early American scientists explicitly adopted a Baconian ideal.<sup>3</sup> But New England Puritans made significant adjustments to that model as they applied it in the New World. The frontier provided them with a unique opportunity. It offered a God-given clean slate standing ready to receive the lineaments of a new order -- a *tabula rasa* on which



they could inscribe at will the principles and products of their method. In the New Eden Puritan scientists enjoyed a *de facto* Baconian laboratory from which all Idols save God had been exorcised -- a kind of "hypothetical space" in which inquiry could be pursued and theory applied outside traditional contexts. When, under the operation of the doctrine of means, Puritan divines discovered that the New Atlantis and the New Eden were in fact contiguous states, a powerful new notion of the role of science in society emerged.

The predisposition of American Colonials to view themselves as residents in Bacon's New Atlantis rested in part, to be sure, on Protestant eschatology.<sup>4</sup> Bacon's "experimental knowledge" correlated directly to the epistemological techniques implicit in the doctrine of means.<sup>5</sup> Moreover, the Colonial scheme of redemption encouraged a view of inquiry which could readily extend itself to incorporate Bacon's ideal of mastery.<sup>6</sup> Ramist logic had the flexibility and scope to accomodate both these value complexes, largely due to the looseness of its definitions. But the apparent affinity between Ramean and Baconian paradigms ran deeper than a superficial subsumption of practical knowledge under the rubrics of faith. It rested, in fact, on explicit methodological parallels which pertained between the two logics themselves.

Bacon, like the New England Ramists, had viewed law as prescriptive -- that is, as a logical construct expressing a rule for action. Under the operation of his logic, Bacon could declare, as did the Puritans, that "Truth and utility are...the very same things."<sup>7</sup> In fact, both Ramean and Baconian models harbored within their reliance on method the potential to issue in pragmatic injunctions like the foregoing and that expressed by Ramist *eupraxia*.<sup>8</sup> Moreover, they fostered a correlative tendency to give full weight to material relations and quantifiable values. But most significantly in the present context, Bacon and Ramus each shared a general confusion concerning the respective roles of hypothesis and induction which had a significant impact on American scientific models.

Bacon had built his logical model around a series of aphorisms described as "anticipations" which presented "the dawn of a solid hope" that the investigator's leap to theory, analogous to an act of faith, would be born out by the processes of verification.<sup>9</sup> The New England Ramists' method likewise built on composite statements which served as indices of divine intent, leading the mind through progressive stages of empirical confirmation. Both models manifested an appreciation of the essential congruence between experimental knowledge and rational insight. Moreover, both systematically conflated the roles which hypothesis and induction played in the identification of

causal processes, consciously integrating the respective functions of evidence and truth.<sup>10</sup>

But where Bacon had left the methodological status of his aphorisms conspicuously vague, New England divines invoked prelapsarian rationality and Biblical truths in support of their composite forms. In the comprehensive Ramean method they thus found a means of validating experimental knowledge which coincidentally supplied a logical justification for the construction of physical laws. In effect, Ramism provided the Colonial mind with the missing methodological links necessary to reconnect the "scattered occasions" of Bacon's "knowledge broken."

The logical integration of hypothesis and induction achieved under Ramist doctrine clearly differentiated American Baconianism from its Continental counterparts. The virtuosi of the Royal Society, who turned to Ramus for rhetorical guidance but to Wallis for instruction in logic, tended to exaggerate Bacon's attention to inductive data and ignored his preoccupation with deep-seated systematic causes.<sup>11</sup> They sacrificed the potential scope of Bacon's science to its practical import.<sup>12</sup> Newton's intellectualization of the inductive process and Locke's subsequent psychological critique served to further isolate English science from synoptic concerns. These restrictions, however, proved patently unacceptable to Colonial Ramists. The *ars technologicae* required that empirical

data be tied to an analogical order to function as raw material for the construction of laws. Thus, although Bacon may have supplied the method of early American science, Ramus clearly supplied the motive.<sup>13</sup>

It proved crucial to the subsequent development of American science that the logical substructures of *technologia* and *eupraxia* remained in place in the colonies throughout the transition from a medieval to a modern scientific view. Miller's research clearly indicates a prolonged period of interaction between Baconian and Ramean paradigms in New England. He places the beginning of the shift from the old to the new physics in 1686, with the emigration of Charles Morton, but consistently argues for the persistence of Ramean logic well into the 18th Century. Even the introduction of Cartesian texts at Harvard represented "no radical break with Ramist methodology," he claims. Indeed, as late as 1719, logic in New England "continued to be closer to Ramus."<sup>14</sup> George Daniels likewise places a definitive shift to the new learning well into the 18th Century, pointing out that Samuel Johnson completed a manuscript synopsis of Ramist *technologia* in 1714 which "did not even demonstrate an acquaintance with Copernicus, to say nothing of Descartes, Boyle, or Newton."<sup>15</sup> The fact that Ramean logical paradigms survived to interact with Baconian constructs well into the 18th

Century served ultimately to differentiate American science from its French and English counterparts.

Indeed, any understanding of American science hinges directly on an appreciation of how Baconian method adapted itself to the requirements of Ramism in the context of the American frontier. Ramism supplied a compelling warrant for the pursuit of science. Under the joint operation of *technologia* and *eupraxia*, Bacon's Book of Nature, as an emblem of God's intention in the world, became the ideal object for scientific investigation. "After making the proper obeisance before the impenetrable sanctuary [of faith]," Miller claims, "the Puritan logician was free to pierce the very secret of nature, to seize upon the eternal and universal laws of the cosmos."<sup>16</sup> Since *technologia* established an analogy between natural law and divine decree, those trained up in method need place no restraint upon their study of nature, but could pursue scientific inquiry as an adjunct to faith itself. Since method expressed the formal mode of reason and reason necessarily conformed to the objective order of nature, its proper application must lead to a true comprehension of the material effects of the divine will.<sup>17</sup> Moreover, *eupraxia* ensured that the fruits of inquiry would not only support the truths of revelation but actually work toward their realization in the new Zion.

The tendency of Ramism to subordinate revelation to reason fostered a correlative tendency to maintain a theoretical noncommitment in the face of scientific advance. Nature's ability to function as a symbol remained far more important to New England Ramists than which system of physics was used to explain its operation. In the context of the *ars technologicae* it mattered little whether one employed Peripatetic or Newtonian constructs to describe the natural order as long as one accepted the essential analogy. Moreover, *eupraxia* clearly stipulated that the choice must be determined by practice, not doctrine, and verified by experience, not authority. Hence, since science posed no threat to faith, Colonial theorists could adopt its discoveries enthusiastically, provided only that they reconcile them, as did Edwards, through the application of method.

Thus, while taking up the cry of *Verulam* in chorus with the virtuosi in London, American scientists had in mind an ideal far different from that pursued by Boyle, Sprat and Glanville. And the practical limitations imposed on the dissemination of information in the Colonies only served to reenforce this integration of religious and scientific purpose. The "new learning" first struck the Colonial consciousness through almanacs, "as ubiquitous in New England as the Bible and nearly as popular."<sup>18</sup> These fragmentary summaries found their way into the pulpits of virtually

every town and hamlet, from whence they filtered down to minds previously conditioned by Protestant *paedia* to rely on rational means in fathoming divine intent.<sup>19</sup> Moreover, the denominational character and geographic distribution of colonial colleges encouraged the propagation of this scientific gospel not only in New England, but throughout the Colonies wherever New England's "first fruits" were called to preach and teach.<sup>20</sup>

But the disruptions which diffused the focus of Puritanism in the 1720's tended to broaden and consolidate the base of the Colonial scientific community. Although the population of New England nearly doubled during this period, that of the Middle Colonies almost tripled.<sup>21</sup> The progressive urbanization of New York, Pennsylvania and the Mid-Atlantic Colonies likewise played an important role in shifting the balance of scientific knowledge off its Puritan axis. And the rapid growth of printing establishments, libraries, newspapers and almanacs -- cultural advantages previously confined largely to New England -- all tended to materially increase the intellectual resources of the more urban middle colonies and so to cultivate an "enlightened" scientific state of mind.<sup>22</sup>

The popularity of lecture series, an intellectual spin-off of the Great Awakening, carried New England's scientific gospel out of the pulpit and into a more secular forum. Inaugurated by Isaac Greenwood at Boston in 1727,

the scientific lecture series (complete with illustrative apparatus) had, by 1740, become "sufficiently well received to become a lucrative source of income for lecturers [throughout] the colonies."<sup>23</sup> Figures like Archibald Spencer and Ebenezer Kinnersley "wowed" them from Portsmouth to Charleston with topics from electricity to anatomy and added substantially to the process of popularization.

Moreover the establishment of important educational institutions free from the direct influence of Puritan orthodoxy further loosened the hold which New England had previously enjoyed on American science. The College of New Jersey (1741), the Philadelphia Academy (1755), King's College (1754), the College of Rhode Island (1764) and Queen's College (1766) all appeared on the scene during these crucial three decades, acquiring libraries and experimental apparatus and vying for recognition as centers of scientific study. Moreover, as Hindle notes, the character of society itself in the Middle colonies had much to do with forming the character of these new colleges. "Those at Philadelphia, New York and Providence," he claims, "demonstrated a broader tolerance which mirrored the cosmopolitanism of the communities that supported them."<sup>24</sup>

By 1723 a nascent scientific community had arisen in New York, centered around Samuel Johnson, Cadwallader Colden, and James Alexander. In the present context it is



interesting to note that Colden drew explicitly on Edwardsean logic, while Johnson had tangible ties to the physico-theologians of the Hutchinsonian school, one of the few surviving Ramist "covens" in England.<sup>25</sup> By the 1730's a similar group had coalesced around the figures of Franklin and Penn in Philadelphia. Although not until mid-century did either of these communities rival that of the older City, by 1768, with the establishment of the American Philosophical Society in Philadelphia, the hegemony of New England in colonial science had been seriously threatened.

And yet the New England Way continued to contribute in significant ways to the construction of late Colonial scientific models. The perpetuation of Ramean logical substructures via the philosophical program of Jonathan Edwards and the extension of those substructures to American social constructs through Revolutionary rhetoric ensured that American science would work for the advancement of society as a whole, not for the enlightenment of an individual mind or the refinement of a disembodied *scientia*. Hindle stresses the fact that "continuity was more conspicuous than change" in post-revolutionary science, while Stearns points out the importance of its communal and federal aspects.<sup>26</sup> The present argument would locate the source of the persistent features of post-revolutionary science in Ramist *technologia* and *eupraxia*,

which insisted on the relevance of knowledge to the construction of a redeemed community and represented science itself as the custodian of the social enterprise.

The Revolution, as the nexus of legal and logical metaphors in American life, established this communal ideal at the very core of the new nation's intellectual life and guaranteed that it would continue to operate through its scientific models. The realist bias of Revolutionary ideology portrayed American science as a social endeavor, dependent upon a matrix of inquiry which transcended the needs and goals of individuals and reached out to embrace the original errand, transformed into a mission of social redemption. Stearns identifies this curious characteristic of American science as a part of "a subtle union of social forces originating in economic, demographic and urban growth."<sup>27</sup> But the fact remains that European communities underwent similar patterns of growth without developing similar scientific ideologies. Again the present argument would attribute the difference to the survival of Ramean metaphors.

Brooke Hindle describes the impact of the Revolution on American science as primarily negative, arguing that it swept away much of its momentum -- a momentum which he claims was not regained until well into the 19th Century. Science was "badly disturbed and disrupted by the war," he claims, citing as primary factors the focus of hostilities

in the cities, the disruption of contact with the international scientific community and the refocusing of intellectual energies on practical issues. While careful to discuss the positive accomplishments achieved during the war -- advances in cartography, engineering and medicine -- Hindle concludes that "the disruptive influence of the war upon the whole pattern of science in America was much more serious than the limited number of beneficial influences it provided." Stearns concurs, maintaining that "while a host of technological contrivances testified to the inventiveness of the early Americans, they also testified to the overwhelming utilitarian bent of the American mind."<sup>28</sup>

Hindle's and Stearn's perspective, however, judges American science by the standards of the Royal Society and ignores those peculiar features of Colonial intellectual life which persisted and in fact matured in what he considers the diminished scientific stance taken by the new republic. While belittling the "utilitarian emphasis" of post-Revolutionary science, Hindle overlooks the fact that the interaction of Ramean and Baconian metaphors in Colonial America had rendered utility a defensible scientific ideal.<sup>29</sup> Baconian "improvement", filtered through the philosophic lens of Ramist *eupraxia*, had emerged as a utility vastly different in both content and scope from that expounded in London. The utility promoted by Franklin, Jefferson and Paine possessed a dimension con-

spicuously lacking in that pursued by Boyle and Sprat -- a dimension which derived directly from the Ramist compulsion to integrate means and ends. Under Ramean logic, utility became a reflection of purpose and technique a hallmark of design. In fact, the "merely" technological focus of post-Revolutionary science expressed values rooted deep in its Ramean past.

Indeed the essential continuity of American Revolutionary ideology with its Ramean heritage influenced the development of post-revolutionary science in important ways. By representing God as the Architect of the national City, Revolutionary ideologues could transfer the emotional propulsion of Puritan eschatology onto the task of nation building. Science in the new republic would thus require no metaphysic to justify its elevation of practice over theory. The practical work of realizing America's special destiny carried with it its own moral imperative. Moreover, the concurrence of this political ideal with the logical metaphors of Ramism encouraged American scientists to cast themselves in a similar image and contributed materially to the rationalization process by which the scientist and technician became the philosophers of the "Workshop of Liberty."

The cultural nationalism awakened by the Revolution extended itself readily to demands for scientific achievement.<sup>30</sup> "What a field have we at our doors to signalize

ourselves in!" wrote Thomas Jefferson, challenging science to fulfill its special mission in the new Republic of Letters. Politicians and pundits commonly interwove the themes of independence and inquiry in appeals to the scientific community to "become a lamp to guide degraded and oppressed humanity." "In Europe Science reigns no more," one partisan claimed, "Their souls are fetter'd with tyrannic power." But in America, liberty "unfettered and expands the human mind, and prepares it for the reception of the most important science."<sup>31</sup> "May we not hope," David Ramsay cried, revealing the deep philosophic undercurrents which supported the rhetorical linking of revolutionary zeal and scientific endeavor, "that the exalted spirits of our politicians and warriors will engage in the...[promotion of] useful knowledge, with an ardor equal to that which first roused them to bleed in the cause of liberty and their country?"<sup>32</sup>

With such a challenge before it, American science turned wholeheartedly to its task. Benjamin Franklin, as archetype and champion of the cause, provided philosophic justification by reading into the Sermon on the Mount a literal interpretation of the Puritan doctrine of means. In an explicit accommodation of Enlightenment ethics and Ramist *technologia*, Franklin propounded a scientific ideal which drew its inner dynamism from a deep conviction that the natural world reflected a rational order which man

experienced through his senses and mastered through his intellect.<sup>33</sup> Ramist *eupraxia* further guaranteed that all inquiry must issue in practical effects which contributed to the constitution of that order. For if all nature expressed a purpose, Franklin argued, then each natural phenomenon must possess an inherent value. By identifying and exploiting that value, man actually participated in the larger design. In fact, Franklin claimed, the ability of science to explicate the intrinsic usefulness of "nature's ways" expressed its entire function and comprised its ultimate moral value.

Franklin's instrumental ethics imparted a special accent to the new nation's demand for "Usefull Knowledge."<sup>34</sup> His typically Puritan view of theory as a guide to action allowed him to forage nature for useful facts while taking for granted those abstract principles which served as the object of "pure" science. Moreover, by translating practical scientific achievements into evidence of a special ordination, Franklin lent a cultural and philosophic significance to technical advances which confirmed a continuing faith in America's mission. Henceforth when post-revolutionary scientists appealed to utility, they appealed to a conception which reached out to deeper values. Each canal or railroad built, each physical obstacle overcome, each technical advance or invention

became an icon of a national destiny writ large in the objective order of things.

The spectacular rate of growth and change which the new republic experienced in the half-century following the Revolution provided its scientists with ample opportunity for vindicating that special faith.<sup>35</sup> A floodtide of immigration, the systematic extinction of the frontier, the vast expansion of the nation's economic base and the social dislocations attendant on progressive urbanization all challenged the scientific community to supply the tools and materials needed to channel this torrent of progress into programs which would preserve the nation's unique axiology. Encouraged by premiums, patents and limited monopolies, American scientists and entrepreneurs applied themselves enthusiastically to an agenda explicitly aimed at massive "improvements" which would contribute to the realization of the nation's millennial dream.<sup>36</sup> Supported by religious appeals to "benevolence" and humanitarian movements for reform, post-revolutionary scientists slipped easily into a new role as Saints of the national Citty. Under the force of events and the operation of a distinct logical heritage, science became the intellectual correlate of the American frontier and the engineer the new folk-hero of the age.<sup>37</sup>

The belief that technology enjoyed a special affinity with the goals of democracy gained force with the rise of Jacksonian populism.<sup>38</sup> In the expansionist atmosphere of

the 1820's and 30's, populist sentiment had little difficulty in submerging any lingering Jeffersonian doubts about the value of "manufactures." Moreover, the new Democratic rhetoric charged science with an explicit reform mission, portraying technological advance as part of a "general social revolution" directed toward "the benefit of...the whole body of the people."<sup>39</sup> This mission was made manifest in the rise of polytechnic education and the lyceum movement, both designed to open avenues of self-improvement and thereby eliminate class distinctions. Moreover the propensity of Jacksonian partisans to articulate their ideals in terms which juxtaposed "the natural" and "the artificial" tended to shift the focus of scientific inquiry away from a concern for the perceived regularities of nature to a concern for the potential of its material effects. The hope of social redemption lay, they claimed, in the enhancement of everyday life and not in the rational comprehension of "artificial" laws by a few elitist minds.

As the infant republic marched to the cadences of Jacksonian rhetoric through the early decades of the 19th Century, a concurrent rush of material progress encouraged a mood of fervid optimism which only served to deepen America's conviction that somehow science drove the inner engines of its millennial dream.<sup>40</sup> Neither the economic distress of the 1830's nor the gathering clouds of sec-



tionalism in the 40's could diminish the nation's faith in the power of technology to carry it forward to greatness.<sup>41</sup> The activist ideal imparted to it by Ramism in the 18th Century allowed American science in the 19th to construe mechanical contrivances as benefactions to the race and factories as vehicles of redemption. The power of invention manifested man's special relationship to God and Americans seemed to possess that power to a degree which gave abundant assurance of national election.<sup>42</sup> Expounded in scientific journals which enjoyed a wide circulation and preached throughout the country in lecture halls and lyceums, America's new technological faith subsumed all previous formulations of national piety under its metaphors. Encouraged by discoveries of gold in the West, political successes abroad and a temporary respite from internal dissension in the Missouri Compromise, celebrants of America's scientific gospel raised a chorus of self-congratulation which seemed to promise that Christ in the Second Coming would in fact arrive by train.

But the philosophic optimism of the 1850's proved the worst possible preparation for the political and intellectual cataclysm of the Civil War.<sup>43</sup> The War tarnished the credibility of the Union as the irreducible logical premise on which the national life had rested. Any consequent philosophic reconstruction would have to incorporate a redefinition of that premise in terms which

could encompass the social realities consequent upon the War. Moreover, the War not only temporarily derailed the juggernaut of material progress which had propelled the nation forward for half a century, it also rent the tightly woven fabric of millennial self-righteousness in which American ideologues had carefully clothed the national dream. The harsh social and political realities of war and reconstruction urgently demanded a reevaluation of those philosophic assumptions which lay at the base of American life.<sup>44</sup>

Chief among these, of course, stood the national faith in technology as the tie that binds. The obvious failure of science, despite its success in spanning the continent, to prevent the disintegration of the union prompted a painful reassessment of the nation's uncritical acceptance of the technological ideal. As post-bellum politicians and theorists turned jointly to the task of philosophic reconstruction, they looked to their former allies in science for reassurance that technology would in fact fulfill its extravagant promise.

By 1865, however, the American scientific community was in the throes of its own ideological revolution. Disconcerting new theories suggested during the preceding decades had exhausted the descriptive potential of existing metaphors and demanded a new synthesizing vocabulary. The vast accumulation of empirical data accomplished under the

banner of Bacon threatened to encumber inquiry by its sheer weight and aroused the suspicion that perhaps science had exceeded the scope of its models. The Baconian method had proceeded under the assumption that the simple accumulation of particular facts would eventually yield a general construct. But the avalanche of data culled from the exploration of a continental laboratory had infinitely complicated the task of classification and had multiplied, shifted and rearranged methodological categories to the extent that they had become essentially meaningless.<sup>45</sup>

The case for chemistry provides a clear example of the problem. In 1768, the French chemist Lavoisier had established a functional method for classifying chemical substances based on two criteria -- an enumeration of elements and an analysis of composition. Based on these criteria he constructed a series of analytical tables designed to methodize the discipline. In one column he listed five categories of simple substances. In an adjacent column he identified compound substances as functions of those simple elements. Acids, for instance, formed one class of compound substances produced by combining simple elements with oxygen, the "acidifying agent." Lavoisier then assigned functional names to the resulting compounds -- the combination of sulphur and oxygen, for instance, yielded sulphuric acid. The same procedure was followed for salts, which became respectively sulphates and sulphites, and so on.

Lavoisier's neat, orderly construct stabilized the chaotic state of chemistry and provided a comprehensive system of nomenclature which made possible important theoretical advances.

But shortly after Lavoisier's death, chemists discovered several new elements which stubbornly refused to conform to his model. By 1830 they had identified several acids which contained no oxygen and at least three other substances which supported combustion. Clearly the new data demanded new metaphors. Since chemistry, unlike mechanics, reached into the very nature of substance itself, this dislocation of theory and data proved particularly disconcerting. To make matters worse, by the 1860's the classical atomic theory articulated by Dalton had been complicated by Helmholtz' and Kelvin's "atomic vortices," which attacked the assumptions of fixed mass which had characterized organic chemistry up to that point. The century had nearly ended before chemists could come to terms with the theoretical implications of the new data and offer alternative explanatory principles.<sup>46</sup>

Disillusionment with existing systems of classification could only aggravate the doubts which plagued American scientists following the War. The inability of Baconian models to provide reassurance became increasingly apparent as the millennial axiology which had previously supported them faded under the force of social circumstance.

American science at mid-century indeed faced the painful realization that its logical constructs could no longer support its theoretical aspirations. Some Baconian diehards responded by claiming that the dislocations were only apparent, resulting from an insufficiently stringent application of method. Benjamin Silliman's castigation of geology as a "merely theoretical and usually a visionary and baseless speculation" articulated this reactionary tactic. Geologists must completely eschew theory, he declared, and apply themselves exclusively to an "actual examination into the nature, structure, and arrangement" of data in order to penetrate the mysteries of the world.<sup>47</sup> The irony here, of course, lay in the intrinsically historical nature of geology as a science, a dimension which Silliman's methodology completely denied.

Reactionary responses like Silliman's generally served only to deepen the persistent tension between theory and practice. One notable exception, however, emerged in the field of social-statistical theory. As census information accumulated, politicians and planners began to develop an interest in trends, identifying the pursuit of progress with the logic of an empirically determined common good. Statisticians and census analysts claimed that by quantifying the notion of "the common good," they could better define social order. A movement perfectly in tune with Jacksonian populism, this arithmetic conception of ethics

transformed qualitative Enlightenment concepts into a majoritarian ethic which claimed the greatest good for the greatest number.<sup>48</sup> But it did little to advance the development of new scientific metaphors.

By contrast, some adventurous minds gave up the attempt to cope with data on a systems level and settled for synecdoche -- the most notable being Emerson, whose use of literary technique went deeper than a stylistic habit of reading sermons in rocks and streams and ultimately took the form of a philosophic principle.<sup>49</sup> Emerson explicitly extended synecdoche to a justification of science by crediting technology with the power to carry the minds of men from an appreciation of particular inventions to a wider sense of wonder at their power.<sup>50</sup> Like a good Ramist, Emerson insisted on the moral implications of science. Machines, he claimed, manifested "the same Spirit that made the elements at first."<sup>51</sup> But these metaphoric excesses, characteristic of a wider Romantic compulsion, merely enhanced the intellectual ambiguity which ultimately served as philosophy for the entire Transcendental generation. The tendency to see technology as an objectification of the power to create and redeem ultimately reduced the role of science to the socio-economic means by which a moribund Calvinism confronted an updated problem of Job. Although such a view went a long way toward validating

programs for improvement, it did little to help formulate an actual philosophy of science.

By far the vast majority of American scientists turned to Scottish realism for reassurance.<sup>52</sup> The facile formulas of the Scottish school provided welcome support to a generation attempting to reconcile a devotion to science with a recognition that it no longer gave purpose and meaning to life. Moreover, the "mental philosophy" explicit in the Scottish realist position flowed easily into those philosophic channels carved by Ramism in the bedrock of American thought.<sup>53</sup> Its epistemological theories expounded an intellectually defensible version of the doctrine of means; its scientific theories retraced the fading outlines of Ramist *technologia*; and its ethical systems tapped the undercurrents of Ramist *expraxia*.

Given logical expression in the treatises of Thomas Reid, Scottish realism patently rejected the logic of inference characteristic of British empiricism, portraying it as a huge collective error rooted in Cartesianism, which "like the Trojan horse...carried in its belly death and destruction to all science and common sense."<sup>54</sup> By interposing ideas between objects and the mind, Reid claimed, Descartes and all his Lockean progeny had obstructed the natural flow of invention and judgement. Dismissing association as "one of the main pillars of skepticism," Reid argued that the process of judgement preceded the formation

of ideas and hence fell "not within the province of reason, but of common sense." "Natural judgements," he concluded, "are therefore a part of the furniture which nature has given to the human understanding. ...They are part of our constitution. ...They make up what is called the *common sense of mankind*."<sup>55</sup>

Reid's topical orientation is patent here. But it becomes even more so in his redefinition of induction, which redrew the line between hypothesis and induction in such a way as to avoid inference entirely and so halt the fatal erosion of metaphysics. Newton's *Regulae*, Reid argued, expressed, not rules of reasoning, but "maxims of common sense." They outlined a non-rational inductive principle which provided man with "an instinctive prescience of the operations of nature. ...Upon this principle of our constitution, not only acquired perception but also inductive reasoning, and all our reasoning from analogy, is grounded," he claimed.<sup>56</sup> By thus redefining inference as a disposition to belief, Reid provided a clear philosophic justification for the epistemology implicit in the doctrine of means, bringing welcome relief to American scientists defending their ideological model against methodological critics.

Reid's logic exerted its strongest influence on American scientific theory through the work of Dugald Stewart, who maintained that the business of the scientist



was simply "to ascertain those established conjunctions of successful events, which constitute the order of the universe...and then to refer them to their general laws" which could only be determined "by an examination of the principles of the human constitution" -- that is, by induction-according-to-Reid.<sup>57</sup> This patently Ramean methodology provided James McCosh at Princeton with a means to integrate scientific advances into a conservative theology. And McCosh in turn championed it across America as the deliverance of science as well as a justification for orthodoxy. In questions of method, McCosh declared, "Stewart must ever be referred to as an authority."<sup>58</sup> That such a metaphysic could merge, even superficially, with Baconian models rested entirely on the philosophic groundwork laid by Ramist *technologia* and *eupraxia*, which reenforced Reid's "inductive principle" and gave it the ability to carry the mind from "successful events" to objective truth.

Francis Wayland, the most influential of the "American Scots," drew on Stewart and Reid to develop an elaborate scientific model which claimed to solve the troublesome "problem of induction" once and for all by simply making the entire predictive element of science over into analogy. Wayland's "Philosophy of Analogy" rested on two principles: "First. A part of any system which is the work of an intelligent agent, is similar, so far as the principles

which it involves are concerned, to the whole of that system. And, second. The work of an intelligent and moral agent must bear, in all its lineaments, the traces of the character of the Author."<sup>59</sup> Thus Wayland went far beyond the relatively modest claims which Reid had made for analogy to declare that it had not only a descriptive but a normative status. Analogical reasoning, he declared, disclosed not only the actual but the *necessary* structure of the universe.

The alacrity with which American scientists reached out to Wayland's "philosophy of analogy" indicates the depth of confusion into which they had sunk. As George Daniels points out, Wayland's logic "was admirably designed to promote loose reasoning and hasty generalizations. Where previously the inductive process of confirmation had seemed intolerably endless, Wayland would dismiss it as largely unnecessary." Yet "virtually any American scientist...could serve as an illustration of the use of analogy in the Wayland sense," Daniels claims.<sup>60</sup> Indeed the praise of analogy had reached such heights in America by 1848 that James Whelpley could take the final step and explicitly identify analogy as the exclusive method of science.

But even the uneasy alliance of common sense and common purpose achieved under Scottish realism could not withstand the fundamental shifts which occurred in scientific theory

as the Century progressed. The stubborn refusal of the "imponderables" to remain in the inferential background of physics underscored the epistemological shortcomings of Locke's psychological critique. Indeed Lockean constructs proved signally ill-equipped to cope with the problem of the "imponderables." Dedicated to the proposition that only sense makes sense, Locke had excluded from inquiry phenomena like atomic particles, electrical currents and fields of force. Consequently, the closer Baconian inquiry carried Lockean psychology to the fundamental building blocks of the universe, the less capable either became of coping with their own data. Yet the obvious explanatory power of hypothetically inferred entities demanded that they be dealt with analytically. All the major empiricists had wrestled with the problem. But still the stubborn irony persisted that the scientific tradition known as "atomism" could not absorb the concept of an "atom." A drastic revision of methodology would be necessary to admit these forbidden hypotheses as viable explanations of physical events.<sup>61</sup>

At the same time the inability of Newtonian mechanics to absorb the troublesome new fields of thermodynamics and electromagnetics discredited prevailing notions of order and change. The principles of classical mechanics declared all motion reversible. But the existence of entropy, suggested by Avogadro's theory of gasses in 1811 and later

confirmed by Carnot, Clausius and Kelvin in the second law of thermodynamics, asserted the existence of irreversible processes -- that is, of phenomena which tended inexorably toward a limit. Quantified by Fourier through trigonometric series expansions, the "irreversibility thesis" allowed for the description of such physical processes as frequencies and dynamic equilibria.

But Newtonian mechanics had no mathematical language adequate to the task of expressing irreversible processes. Statistical theory stepped in to fill the gap, particularly after James Clerk Maxwell applied his bit of Victorian whimsy to the problem, but statistical laws could not satisfy the methodological demands of classical physics. Moreover, the ether, which had previously served as a convenient repository for those properties of matter and energy which didn't fit the Newtonian mold, could no longer offer any help since its assumed qualities had come under attack in the "ether drift" experiments of Michelson and Morley. The methodological conflict remained unresolved, in fact, until Einstein's work on Brownian motion revealed the physical and philosophical import of atomic theory, providing a logical bridge from classical to quantum mechanics.<sup>62</sup>

The increasing credibility of these hypothetically inferred entities and forces distorted the logical categories under which men inquired into nature. Then,

into this philosophic "critical mass," Darwin introduced the catalyst of evolution, destroying the relevance of analogical argument and forcing a reevaluation of the goals and processes of inquiry itself. As many of Darwin's critics hastened to point out, evolution by natural selection did not describe a scientific principle based on induction. Despite Darwin's massive array of evidence, his theory remained just that -- a unifying hypothesis with no objective ground in the natural world. Yet the inability of taxonomic methods to produce anything even approaching the manifold explanatory potential of Darwin's model only served to underscore what critics and champions alike began to perceive as "the limits of Baconianism."<sup>63</sup>

This series of methodological shocks proved particularly disorienting to American theorists. Although prepared by Scottish realism to accept the explanatory potential of the "imponderables," American ideologues remained curiously loathe to accept their unsavory philosophic consequences. Reid's endorsement of immediate perception allowed for the analysis of "imponderables" despite their stubborn refusal to display the normal attributes of matter. But microcosmic systems had little relevance to the Ramist *ars technologicae* and the doctrine of means specifically stipulated that man's rational faculties could adequately comprehend the natural order. How, then, could these unthinkable thoughts function in

inquiry? Until concepts like atomic valency, radiating energy and molecular structure could boast an objective reference they literally had no "place" in scientific method.

Likewise, although prepared by a millennial axiology to sacrifice the concept of "reversibility" in physics, American theorists proved peculiarly reluctant to integrate the correlative notions of "force" and "field" into their cosmology. Irreversibility confirmed the directionality of time, a concept crucial to the eschatological bias of American ideology. But the second law of thermodynamics described a movement from order to disorder which encouraged analogical extensions of "dissipation" and "degradation" at the macrocosmic level. This presented an urgent philosophical problem to minds trained up in Puritan doctrine and the Revolutionary faith.<sup>64</sup>

Moreover evolutionary theory drastically altered those taxonomic schemes which had previously supported the natural sciences. Indeed it struck directly at the roots of that analogical method which had allowed American ideology to extend its metaphors across all disciplines and effectively neutralized both the content and the method on which American inquiry had come to rely. The classical notion of species, like the topical notion of a "place," had expressed a fixed grouping of terms under an immutable order. From this notion flowed the protean concept of the

"great chain of being" on which all analogical reasoning drew. But Darwin's principle of selection destroyed logical as well as biological fixity. By representing the species as naturally and inevitably mutable, it undercut not only the classification systems of natural science but both categorical and topical schemes of organization as well. The implications of the reduction of the species to a phenomenal level proved patent and devastating. "It is like confessing murder," Darwin himself remarked.<sup>65</sup>

By the early 1870's, the compelling need for a new logic of science had become patent. Wayland's naïve, psychologized "principle of induction" simply could not supply data adequate to the demands of an increasingly sophisticated scientific community. The hypothetical notions arising out of thermodynamics and electromagnetics simply had no "place" in Baconian or Ramean methodology. Baconian science had no way to account for postulational entities, while Ramism, though supporting hypotheticals in discourse, had no way to produce logical predicates which could provide them with an objective content. Moreover, Darwin had exposed the monolithic conceptions of system which had characterized modern science up to that point as essentially inadequate descriptions of reality. The sweeping philosophic implications of these methodological dislocations clearly underscored the fact that American logical models had fallen drastically out of step with funda-

mental issues in the philosophy of science.<sup>66</sup> Driven by an urgent need for new metaphors adequate to the expression of a reconceived reality, American scientists began a search for a new methodology. And a persistent Ramean heritage ensured that the first step in the process would be to articulate a logic which could underwrite the method.

The impact which these methodological shifts had on those national scientific models outlined in previous chapters provides an interesting comparative reference for the logical accomodation achieved by American philosophy under the shock of scientific advance. In England, for example, Darwin's developmental hypothesis confronted a Newtonian world whose physical aspect expressed absolute permanence and whose logical essence consisted in abstract quantity. Indeed for Newton, the abstract truths of mathematics enjoyed logical certainty precisely because they remained devoid of any empirical content.<sup>67</sup> Such a mechanical universe left little or no room for biological analogy.<sup>68</sup> The transformations which had preoccupied Newton had no reference in concepts of process or growth. They took place rather through simple changes in the position of discrete particles driven by purely mechanical means. The word "development" in its Darwinian sense thus had no reference in English thought.<sup>69</sup>

Locke's associationist critique, carried to its logical extreme by Hume, expressed the inevitable methodological



correlate of Newton's corpuscular view. And just as English physics could not easily absorb the random events explicit in Darwin's theory, so English logic resisted the concepts of probability and hypothesis implicit therein. Locke had denounced all hypotheses as mere "inventions and creatures of the understanding." Hypotheses had no additive value, he claimed, only a negative function as vehicles of verification. But since Darwinian theory tended to endorse hypotheses as constructive forms, Locke's inferential logic and any philosophy of science based thereon must prove inadequate for its purposes.<sup>70</sup> Throughout the late 19th Century the Mills' "savage logic," which stubbornly upheld Newton's limiting definition of a *vera causa*, perpetuated this Lockean bias in English science.<sup>71</sup> In fact, only with a belated appreciation of Whewell's "philosophy of discovery" did English logic begin to integrate the methodological implications of evolution into their philosophy of science.<sup>72</sup>

Likewise French theoretical constructs proved curiously unresponsive to the philosophical demands of Darwinism. The French scientific tradition had been initiated by a radical act of separation of man from his environment. Descartes' *cogito*, extended to the natural world in *Le Monde*, had redefined science as an axiomatic discipline which itself determined and structured experience. "Allow your imagination to leave this world," Descartes enjoined

the scientist, "and visit an entirely new one which I will cause to be born in these imaginary places."<sup>73</sup> Under Cartesian rules, the scientist imposed his own logical order upon nature to extract meaning. By defining this new order, he guaranteed his ability to investigate it unencumbered by perceptual limits. But the logical priority thereby given to mechanism over experience made Cartesian constructs peculiarly unreceptive to evolutionary forms.

Cartesian logic had provided the *philosophes* with a justification for grounding change in antecedent law. But, like Newton's transformations, the naturalists' transformism left no room for the precarious aspects of environmental determinism described by evolution. Neither Laplace's physics nor Diderot's biology could accomodate concepts of emergence or novelty. This persistent Cartesian bias, made explicit in biology by Lamarck's unilinear development and in logic by Comte's positivism, continued to insulate French theory from the methodological implications of Darwinism in much the same way that Locke had done in England.<sup>74</sup> Indeed not until the end of the 19th Century, with Bergson's "creative evolution," did French theoretical models begin to display genuine evolutionary features.<sup>75</sup>

The German response to Darwinism proved somewhat more complex -- if no more positive -- than that of England or

France. Prepared in some ways by a strong morphological tradition to accept developmental constructs in both science and philosophy, German theoretical models nonetheless displayed a curious incompatibility with evolutionary doctrine -- an incompatibility grounded ultimately in logic. While German dialectical models allowed for a principle of development grounded in logical structure, they had no mechanism for extending that principle to existence. On the one hand, this rendered them more flexible and open to creative theory. On the other, it made it difficult for them to perceive the practical potential of Darwin's work. Moreover, the philosophical idealism which dominated German thought throughout the 19th Century contained its own built-in evolutionary scheme which rendered Darwin's hypothesis essentially superfluous.<sup>76</sup>

Wolffian logic had declared existence a "complement of possibility," strictly limiting any notions of biological development to a metaphoric movement within a logically antecedent frame. This doctrine, known as "preformation," stipulated that natural development took place as a successive unfolding of a predetermined organic constitution, not as an autonomous or random process like the one Darwin described.<sup>77</sup> Kant's reduction of Wolff's logical categories to functions of time had done little to render Wolffian constructs more receptive to evolution since Kant's imperatives operated primarily on the *noumena* and

had little relevance at the organic level. For Kant, although causal sequences pertained in both the noumenal and the phenomenal realms, each proceeded under the operation of its own imperatives.<sup>78</sup> It was a misconstruction of these distinct imperatives which the Post-Kantians perpetuated *ad nauseam*. Darwinian theory, on the other hand, placed Kant's *noumena* and his *phenomena* on the same timeline, as it were. By making psychic activity an evolutionary consequence of physical development, Darwin not only neutralized Wolff's metaphysical priorities, he pulled the logical ground out from under Kant. Unable to find support in its native philosophical traditions, German science fell back on an unrelenting experimentalism relieved by flights of idealistic fancy. Only with Nietzsche's "Philosophy of Becoming" did it acquire a logical mechanism capable of establishing the priority of process over structure.<sup>79</sup>

Predictably, according to the current argument, the impact which Darwin had on American philosophy proved substantially different from any of these. Evolutionary theory struck chords in America which had no harmonics in European thought. In the New World, Darwin spoke directly to the heart of a young society whose national life appeared almost as a caricature of an evolutionary model. The transforming power of the environment exerted itself as a fact of life in America. Moreover, the philosophical

implications of Darwinism converged there with an ideology grounded in concepts of conversion and election. When 19th Century American scientists reached out for principles of order, they reached out, not to Mill or Comte or Hegel, but to a distinctive logical tradition which had subsisted in American thought since the founding of the City. The philosophic undercurrents of Ramism which had fed into American theory throughout the Colonial and Revolutionary eras ensured that the radical shifts in scientific theory described above would interact with logical metaphors substantially different from those encountered in England, France or Germany.

Although at first the American response to Darwinism followed a predictable course, the speed with which American theorists achieved an accommodation with its philosophic implications suggests the operation of factors unique to the American intellectual milieu.<sup>80</sup> The doctrine of means had explicitly acknowledged the precedence of creation over revelation. The Book of Revelation, it claimed, had been written as a sequel to the Book of Nature. This crucial doctrine, supported by the Ramist *ars technologicae*, had enabled Puritan divines in the 18th Century to interpret Newtonian mechanics as an expression of Providential design. In the 19th, it provided latter-day Saints with a cogent argument for incorporating evolutionary theory into the national axiology.

In fact, as Darwinian theory adapted itself to the American intellectual environment it produced theoretical offspring which bore a strong genetic resemblance to their Puritan forebears. The Ramean metaphors embedded in American ideology translated the Darwinian hypothesis into a process by which each species underwent a refinement of structure directed at ensuring its biological "immortality." Development became an analog of conversion and survival a mode of redemption. Adaptation came to represent a biological integration of means and ends not unlike that achieved under the doctrine of means, while natural selection expressed the biological correlate of election. Thus evolution, viewed from a Ramean perspective, displayed a distinct realist bias. It extended a degree of permanence and constancy to the world of present experience by explaining it as a developing system of steadily increasing structural density.

By merging the developmental aspects of Darwinism with the emotional thrust of their ideology and the structural bias of their logic, American theorists could argue for a philosophical program which stood midway between mechanism and teleology -- an option not open to English theorists (committed to experience), French theorists (committed to mechanism), or German theorists (committed to structure). *Technologia* ensured that this distinctive evolutionary model would infiltrate those disciplines previously

encompassed by natural philosophy.<sup>81</sup> *Eupraxia* ensured that it would permeate the social and political economy as well. Indeed by the 1870's, this unique national hybrid of Bacon, Ramus and Darwin had spread itself, in true pansophist fashion, across the entire spectrum of American thought. In what Stow Person's calls "a paradoxical mixture of scientific objectivity and moralistic preachment," theorists in all fields reached out to its metaphors for a means whereby to synthesize the increasingly disparate vocabularies of philosophy and science.<sup>82</sup>

"Gospellers" of all stripes hastened to invoke the new metaphors in support of their cause. The scientific gospellers, thrown off-stride by the War and its consequent disruptions, found renewed justification for their technological creed in an industrial naturalism which tempered a Malthusian interpretation of Darwinian selection with a persistent millennial axiology.<sup>83</sup> The social gospellers concocted a reform ideology out of an amalgam of Baconian statistics, environmental determinism and Puritan ethics.<sup>84</sup> Theists like John Fiske and Frank Abbott attempted a philosophic reconstruction of orthodoxy which employed Baconian "improvement" and emergent evolutionism to buttress a traditional eschatology.<sup>85</sup> And "evolutional idealists" like Joseph Leconte propounded laws of cyclical advance which read concepts of evolutionary growth as evi-

dence of a dialectical reasonableness energizing the world.<sup>86</sup>

The one characteristic which all these various theoretical constructs shared was a realist bias -- a bias embedded in what the present argument will call "the continuity thesis." The continuity thesis simply assumed that no absolute discreteness existed anywhere in nature or experience. It expressed the persistent commitment to antecedent structure which had permeated American intellectual life since New England's "first fruits" had begun spreading the gospel according to Ramus in the 1600's.<sup>87</sup> Evident in such diverse constructs as Edwards' logic, Adams' covenant and Jackson's populism, this commitment continued to underwrite American thought throughout its period of philosophic adjustment in the 19th Century and became an integral part of those models which American science developed in response to scientific advance.

Indeed the realist of bias of their intellectual heritage enabled many American scientists to marshal support for new theoretical constructs by claiming that they merely restated this principle of continuity in "scientific" terms. Hence thermodynamics demonstrated the cosmic reality of purposefulness,<sup>88</sup> while electromagnetics confirmed the existence of effective forces at work in the world.<sup>89</sup> Darwinian theory, far from discrediting metaphors of continuity, merely made their logical structure objec-



tive and open-ended. Sumner's "folkways,"<sup>90</sup> Ward's "telic structures,"<sup>91</sup> Fiske's "roaring loom of Time,"<sup>92</sup> and Leconte's "residuum"<sup>93</sup> all gave metaphoric expression to this characteristic commitment to perpetuate the principle of continuity in American ideology.

Predictably the "continuity thesis" emerged most clearly at precisely that theoretical point at which science and logic intersected -- at that nexus of American intellectual life where Bacon and Ramus had converged to create a unique scientific ideology. The intellectual atmosphere peculiar to the development of American science had encouraged the integration of natural history and natural philosophy. As late as 1874, Louis Agassiz could still give a ringing endorsement to this persistent Ramean orientation: "It cannot be too soon understood that science is one, and that whether we investigate language, philosophy, theology, history or physics, we are dealing with the same problem, culminating in the knowledge of ourselves. ...Our own nature demands from us this double allegiance."<sup>94</sup> Bacon and Ramus' joint conflation of hypothesis and induction had provided a methodology curiously well-suited to support such an analogical model.

But by removing God as the last remaining Idol in America's Baconian laboratory, Darwin had, in a sense, made the analogy real. Under evolutionary doctrine natural history and natural philosophy did *in fact* express coordinate

value systems, thereby rendering science, from a Ramean point of view, a system of encyclopedic radii which reached out to no encompassing circle. And the problem for American logicians became one not unlike that which medieval scholastics had faced in the doctrine of transubstantiation -- that of determining whether a discrete fact could contain the logical attributes of a wider truth. Thus stood the case for America's philosophy of science when Charles Sanders Peirce began his inquiry into its theoretical structures in the 1870's. Guided by conceptions of law and principles of order embedded deep in his intellectual heritage, Peirce would attempt a reconciliation of positive science and realist logic which clearly reflected the thrust and disposition of American values.

# CHAPTER NOTES

1. Stow Persons, American Minds (New York, 1975), 116. Likewise Stearns points out that despite the often arbitrary character of historical periodizations, it remains a patent fact that "the Old Colonial Era of American history...closely paralleled the beginnings of early modern science" (Science in the British American Colonies (Urbana, 1970), 3).

2. Morton White, Pragmatism and the American Mind: Essays and Reviews in Philosophy and Intellectual History (New York, 1973), 96.

3. George Daniels describes the "reign of Bacon in America" as nearly universal (American Science in the Age of Jackson (New York, 1968), 63). For the presence of Baconian theory and method in colonial curricula, see Daniels' chapter "The Transit of Ideas" in Science in American Society (New York, 1971), and Morison's chapter "Scientific Strivings" in Life. See also Miller, Mind, 207-238 and Colony, 12-15; Stearns, British Colonies, 44-83. For specifically focused works see Bernard Jaffe, Men of Science in America (New York, 1944); Nathan Reingold, The Sciences in the American Context (Washington, D. C., 1979); Brooke Hindle, The Pursuit of Science in Revolutionary America 1735-1789 (Chapel Hill, 1956).

4. Hooykaas points out that "there was no hard and fast dividing line" between religious reformers and scientific reformers in the 17th Century. "Both returned to truly 'ancient learning', the former to the Book of Scripture and the latter to the Book Nature" (Religion, 137-138). Stearns concurs, noting that under Puritan models there was an essential unity "between the knowledge of God revealed in the Bible and natural knowledge obtained by rational, experimental means" (British Colonies, 160). See also Craig Walton, "Bacon and Ramus....," 290-297.

5. Not all scholars subscribe to this view. Richard Greaves, for example, claims that "despite the assertions of Max Weber and R. H. Tawney, the theological tenets of Protestantism played no major role in fostering the rise of modern scientific thought." Instead of theology, Greaves claims, "the mediating link is revolution. ...To the extent that Puritanism was responsible for and participated in [dissent], it was indirectly a factor in the development of modern science" ("Puritanism and Science: The Anatomy of a Controversy," JHI 30(1969):345, 367-368). Greaves seems to ignore here the role which Reformation theology played in the construction of revolutionary ideologies.

6. Michael Hattaway develops the argument that "Bacon's concept of laws...has behind it the whole reverential tradition of Christianity" ("Bacon and 'Knowledge Broken': Limits for Scientific Method," JHI 39(1978): 187-193). Greaves, on the other hand, points out that there were important differences between Baconian and Puritan eschatology. "The welfare which a scientist might seek through the technological application of scientific data was material welfare; the kind of welfare which was of predominant concern to a Puritan was spiritual welfare." The analogy cannot be maintained, he claims, "unless it can be demonstrated that the Puritans forsook their chiliastic beliefs...and replaced them with the concept of a progressively improving society which would one day usher in the blissful millenium" ("Puritanism and Science...", 349-351). But this is in fact what happened in America. Greaves, writing from the perspective of English Puritanism, finds lacking exactly those transitions found to be central to the development of American thought in Chapter VI.

7. Bacon, *Novum Organum*, I, cxxxiv.

8. An important caveat pertains here in linking utilitarian ideologies to Ramean logic or it, in turn, to pragmatic thought. The weakness in demonstrating the parallel lies in a mistaken tendency to equate the terms "utility", "*eupraxia*" and "*usuaris*" (an epithet applied to Ramus indifferently by friend and foe - a fact which in itself speaks for its ambiguity). The terms, whose roots are linguistically interchangeable in some cases, in fact derive from markedly different contexts. This is essentially the difficulty which Walter Ong points out in the work of Frank Peirpont Graves who he claims falls into the trap of rendering John Dewey a latter-day Ramist on the strength of a linguistic argument. While it is clearly not my intention here to fall into this same trap, it is important to point out certain clear methodological congruences between Ramean and Baconian logic which do, in fact, encourage such a misconstruction.

9. Bacon, *Novum Organum*, I, cvi. Bacon described aphorisms as "knowledge of scattered occasions" extended to encompass a principle of action (*De Augmentis*, V, 36). Hattaway claims that "to write an aphorism it is necessary to recognize not only what is closed, certain in one's mind, but what is open, what is created by the language, categories and perceptions one is using" ("Knowledge Broken'...", 183).

10. Hattaway comments on Bacon's "confusion of essences and accidents, primary and secondary qualities" and agrees that Bacon systematically confused the "contexts of discovery with the contexts of verification" (Ibid.,

189, 191). But this is simply the converse of the argument which Ong presents concerning Ramus' description of hypothetical syllogisms as a "primitive form of induction" (See above, p. ??).

11. Jeffrey Barnouw points out that "Bacon stands in opposition to the characteristic approach of...the Royal Society generally," and claims that the members of the Royal Society deliberately exaggerated Bacon's concern with utility as a criterion for cognition ("The Separation of Reason and Faith in Bacon, Hobbes and Leibniz," JHI 42(1981): 609). Barnouw fails to tie his argument to specifically logical issues. In the present context, however, it seems reasonable to argue that Bacon's methods impinged on the strong Neo-Aristotelian bias of the Society itself, a bias made manifest in Wallis' logical texts and subsequently in Newton's critique of hypothesis and induction.

12. Bacon's perspective on the role of teleological concepts in science ran considerably deeper than the standard empiricist interpretation given his method by Boyle and others. In fact, his critique of metaphysical systems anticipated Kant to a certain extent by referring all teleology to a human perspective. Although on the one hand this relegated inquiry into final causes to metaphysics, at the same time it validated that inquiry and linked it to empirical data. This is essentially the link which the present argument claims for Bacon and Ramus.

13. It is interesting as an aside to note an explicit tie between Baconian and Ramean logic via Comenian philosophy. Hugh Kearney claims that the rationale of the Royal Society itself derived, not from Bacon at all, but from Ramus via Comenius. "When Pym and the Puritan party invited Comenius to England in 1641, they were turning to a continental Ramist, reared in the Ramist centre of Herborn, and a man whose *Janua Linguarum* stressed a utilitarian and simplified approach to the study of languages in the spirit of Ramus" ("Puritanism, Capitalism and the Scientific Revolution," Past and Present 28(1964):96). Greaves, on the other hand, points out that Comenius himself was greatly influenced by the German Baconian Wolfgang Ratke ("Puritanism and Science...", 349). Either of these perspectives serves to bolster the current argument.

14. Miller, Mind, 121, 221.

15. Daniels, Society, 87.

16. Miller, Mind, 163. See also Miller's chapter "Science as a Form of Contemplation" in Life, 275-280.

17. Calvin had taken a similar stance with relation to

science but he deferred ultimately to the omnipotence of God. In this sense, he bares a closer affinity to Scotus than do the colonial Puritans. Indeed where the New England divines part company with Calvin on the issue of science is precisely at that point where their Ramean logic intersects with their theology, that is at that point where perfect rationality succeeds in subordinating the force of revelation to its own operation.

18. Daniels, Society, 72. The present argument does not assume that scientific activity in the American colonies was limited to New England. Certainly correspondents like William Byrd II and Edward Diggs of Virginia had absorbed the spirit of Bacon, but, unlike their New England counterparts, who were driven to justify their science in terms of their logic, they made little attempt to rationalize or enlarge upon it. Scientific activity in the Southern Colonies tended to remain more in tune with the Baconianism of the Royal Society itself.

19. Daniels points out that almanacs "were the chief written agencies in propagating the new learning" in New England and did much to shape its development. Significantly, he notes, "the information contained in the almanacs generally remained at least a decade out of date." Moreover, Colonial theorists often missed the preliminary discussions of the new learning. "Handed to him as a finished product, with the earlier difficulties removed and the inconsistencies smoothed out," Daniels claims, "the new system carried such conviction that acceptance of it virtually amounted to a conversion experience" (Ibid., 73-75).

20. "The [denominational] character of the colonial colleges," Hindle notes, "was an important determinant of the nature of the science they could support." The fact that "each college was a community institution serving a recognizable region and dependent upon that region for its support" encouraged this bias (Pursuit, 80-101).

21. Pennsylvania's population rose from 85,637 to 240,057 between 1740 and 1770; that of New York from 63,665 to 162,920. Although significant increases were also seen in the Northern and Southern colonies, Stearns points out, "the rate of population growth had been most rapid in the middle colonies" (British Colonies, 503).

22. "Publishing media multiplied at such a rapid rate that some ninety newspapers were established by 1790," Hindle observes, "including dailies in Philadelphia, New York and Charleston" (Pursuit, 258). Through these media "the diffusion of science, first undertaken by the Boston newspapers, spread all over the colonies" (Stearns, British

Colonies, 506).

23. Ibid., 507-512.

24. Hindle, Pursuit, 85.

25. See Herbert Schneider, "Glory or Gravity: Hutchinson versus Newton," JHI 22(1961):303-322.

26. Hindle, Pursuit, 380; Sterns, British Colonies, 399. "Probably the New England town system of early settlement contributed to this community aspect of early scientific endeavor," Sterns speculates. Whatever the source, "this community aspect of the New England scene, evident only at Boston among all the British colonies of America in the 17th Century, was soon paralleled in Philadelphia and elsewhere, until, shortly after mid-century, it included a number of interlocking 'circles' of colonial scientists...[which] were the principal -- if not the sole -- custodians and promoters of science in the new republic" (Ibid., 685).

27. Ibid., 676.

28. Hindle, Pursuit, 219-247; Sterns, British Colonies, 683-685.

29. Hindle, Pursuit, 190-195.

30. "Patriotism and pride conceived within the framework of the Enlightenment," Hindle notes, "led men who were sensitive to intellectual values to feel that scientific accomplishment was a necessary measure of national justification" (Ibid., 382). I. Bernard Cohen describes the historical provenance of the link between 'science' and 'revolution' in "18th Century Origins of the Concept of Scientific Revolution", JHI 37(1976):264, 286.

31. Quoted in Daniels, Society, 144-146.

32. Hindle, Pursuit, 250-251. "The heritage left by the Revolutionary generation contained no more important element," Hindle argues, "than this faith that science would flourish in America and that it would be instrumental in advancing the wealth and happiness of the nation" (Ibid., 385). Daniel Boorstin presents a similar view in his chapter "The Quest for Useful Knowledge" in Lost World, 213-224.

33. McGiffert claims that Franklin "placed frontier morality on a utilitarian footing, and gave it empirical foundations." Without explicitly tying his argument to logical issues, he points out that Franklin stated his

ethical maxims in hypothetical form, claiming this as "indicative of their scientific character" (Puritanism, 151). Since Franklin's entire "Table of Virtues" is expressed as a collection of composite statements, it seems reasonable here to see this as indicative of their Ramean character as well. For a discussion of the moral and philosophical dimensions of Franklin's thought and their explicit ties to Puritan doctrine, see Koch, "Franklin and Pragmatic Wisdom" in Power, 14-22 and McGiffert, "The Puritan Becomes American" in Puritanism, 83-89.

34. Opinions on Franklin's value as a scientist range from denigrations of his ineptness in mathematics (Conkin, Puritans, 90-91) to praise for his "passion for theoretical understanding" (Koch, Power, 16). Only an understanding of Franklin's philosophic commitment to integrate theory and practice in a conception of utility which reached out to deeper values can serve to reconcile these two views. For balanced assessments of Franklin's scientific accomplishments and their place in the European and American scientific communities, see Stearns, British, 619-615; Daniels, Science, 64-68.

35. Daniels points out that "the public received a good return on its early investment in science. ...Despite [occasional] dissatisfaction, on the whole it was a good bargain for all parties involved" (Society, 205). For a narrative treatment of the explosive growth which occurred between 1800 and 1850 which specifically treats the inter-relationship between rates of expansion and perceptions of progress see Oscar Handlin's chapter "Migration and Expansion" in Americans, 195-254.

36. George Daniels outlines the programs aimed at promoting practical improvements during this period in Society (114-121) and Jackson (6-33). Perry Miller refers his readers to a contemporary source in Samuel Miller's Brief Retrospect of the 18th Century (1803), which he fashions "one of the major productions of the early Republic, for a summary of that 'mass of improvements' achieved by science in the years following the Revolution."

37. Bell points out that such an inversion would have been impossible in England where "the ruling class...was not educated to see the possibilities, through industry, of scientific techniques (Newtonian Science, 2).

38. Daniels argues that American science in fact entered a "crucial middle period" during the reign of Jacksonian ideology, a period "in which the foundations of our national scientific community were established" (19th Century American Science (Evanston, 1972), 54). Miller agrees that the rise of American technology was "in part a



manifestation of [the] Jacksonian Revolution" (Life, 322). For a detailed discussion of the ties between Jacksonian populism and technological science, see Schneider's chapter "The Common Man" in History, 99-116.

39. Richard Hildreth, The Theory of Morals (Boston, 1844), 271-272. See also Bruce Sinclair's article "The Promise of the Future: Technical Education" in Daniels, 19th Century, 249-272.

40. Samuel Tyler presented the most systematic exposition of the national mood in his Discourse of the Baconian Philosophy (1846). Daniels identifies Tyler as "the foremost apostle of Bacon in America" and presents a perceptive analysis of his role in convincing the American public that applied science indeed pointed the way to social redemption (Jackson, 69-85, 54).

41. For a quantitative analysis of American science during this period see Robert V. Bruce, The Launching of Modern American Science (New York, 1987).

42. Perry Miller comments perceptively on the metaphoric value given to invention in the rhetorical flourishes which politicians showered on American ingenuity. Likewise Hans Jonas comments, in a more general vein, on the important metaphorical shifts which inventions like steam power imposed. Previous technological advances had harnessed natural powers, Jonas argues, leaving primal forces within the natural realm. But steam actually created an artificial force -- removing powers previously reserved for God and placing them in the hands of man (Essays, 71-72).

43. J. L. Thomas describes the Civil War "as an intellectual counterrevolution" in a perceptive discussion of its effects on American philosophy in "Romantic Reform in America: 1815-1865" in Katz, Perspectives, 466-491.

44. Van Wyck Brooks presents a poignant picture of the intellectual disorientation which followed in the wake of the war at end of his narrative, The Flowering of New England: 1815-1865 (Boston, 1936). Perry Miller presents a more disinterested summary in American Thought: Civil War to World War I (New York, 1954). In the present context, it is important to note that these patterns of conflict made difficult theoretical issues inseparable from issues of enormous practical significance and wide-ranging social consequence.

45. Daniels identifies the naturalists as one exception to the negative impact which a superabundance of raw data had on theory. Not until the 1860's, he claims, had

American naturalists completed their preliminary work of cataloguing and labeling the wealth of flora and fauna the New World had provided. Undistracted by forays into theory, Daniels claimed, they were actually able to complete this indispensable survey work more quickly (Jackson, 102-117). Daniels' observation may also help to explain the ease with which American natural science adjusted to Darwinism. Not yet having begun to formulate scientific constructs to support their data, American naturalists could adopt Darwinian principles without confrontations between it and existing models.

46. For a discussion of the significance of chemical developments in the 19th Century see G. M. Fleck, "Atomism in Late 19th Century Physical Chemistry," *JHI* 24(1963):106-114.

47. Benjamin Silliman, American Journal of Science I(1818):416.

48. For a discussion of social statistics which reaches back to issues discussed in Chapter VI see P. C. Cohen, "Statistics and the State: Changing Social Thought and the Emergence of a Quantitative Mentality in America, 1790 to 1820," *WMQ*, III 38(1981):35-55.

49. In social theory this synecdochic bias manifested itself in the reform ideologies of Samuel Gridley Howell, Dorothea Dix and Bronson Alcott who explicitly defined the good of the community in terms of individual self-fulfillment. In the liberal arts the bias appeared in historians like Francis Parkman and George Bancroft. In literature it emerged in the localism of Hawthorne, the psychology of Poe and the symbolism of Melville; in the graphic arts, in the keen perceptions of the Hudson River School.

50. See "Works and Days in Complete Works of Ralph Waldo Emerson, ed. E. W. Emerson (Boston, 1903), VII, 185). In "Progress and Culture" Emerson went even farther, claiming the "chief value [of technology] to be metaphysical" (*Ibid.*, VIII, 220-221).

51. See "The Uses of Natural History" in The Early Lectures of Ralph Waldo Emerson, ed. S. E. Whicher (Cambridge, 1959), I, 15-45); and Journals of Ralph Waldo Emerson (Cambridge, 1960), IX, 161). Leonard Neufeldt points out that such a view of technology is "virtually synonymous with what the classic Greek term *techne* denoted ("The Science of Power: Emerson's views on Science and Technology in America," *JHI* 38(1977):333). In the present context it is interesting to note that it is also virtually identical to the philosophic rationale behind the Ramist *ars tech-*

*nologicae.*

52. Next to Baconianism, Daniels claims, the Scottish philosophy was the most popular vehicle for 19th Century philosophers of science (Jackson, 199). Herbert Schneider agrees, outlining the process by which "Scottish philosophy invaded the country and rapidly crowded out the older 18th Century texts" (History, 208-211). Miller claims that "for five or possibly six decades [Scottish realism] constituted what must be called the official metaphysic of America" (American Thought, ix). Manfred Kuehn presents an argument, interesting in the present context, for the theoretical affinities between Scottish realism and German thought in his "The Early Reception of Reid, Oswald, and Beattie in Germany : 1768-1800," JHP 21(1983):479-491.

53. Although Reid can hardly be called a Ramist, Howell points out that he was influenced by Ramus' 1555 French edition of the *Dialectique* and often referred with approval to Keckermann's *Systema Logicae*. In his own Brief Account of Aristotle's Logic (1773) he described Ramus "as having made additions to Aristotle's theory of the syllogism" and called him a reformer in philosophy "who had a force of genius sufficient to shake the Aristotelian fabric in many parts." Howell also emphasizes Reid's linguistic analysis as a survival of Ramean rhetoric (Howell, Logic, 372-391).

54. Thomas Reid, An Inquiry into the Human Mind..., (Dublin, 1764), II, 455-457.

55. Ibid., II, 417-418.

56. Ibid., 497-499. See also Laudan, "Thomas Reid..." in Butts and Davis, Heritage, 122).

57. Outlines of Moral Philosophy in Works of Dugald Stewart, (Cambridge, 1829), III, 376, 380.

58. James McCosh, The Scottish Philosophy... (New York, 1875), 292. For a discussion of Stewart relevant to the present argument, see Salim Rashid, "Dugald Stewart, 'Baconian' Methodology, and Political Economy," JHI 46(1985):246-257. Interestingly, Rashid describes Stewart's as an "almost Austrian methodology".

59. Francis Wayland, American Philosophical Addresses ed. J. L. Blau (New York, 1946), 353.

60. Daniels, Jackson, 169-178.

61. For relevant discussions see J. P. Monteiro, "Hume's Conception of Science," JHP 19(1981):327-342; N. S.

Arnold, "Hume's Skepticism about Inductive Inference," JHP 21(1983):31-55; D. E. Soles, "Locke's Empiricism and the Postulation of Unobservables," JHP 23(1985):339-369.

62. For relevant discussions see Bell, Newtonian Science, 152-168; Ian Hacking, "19th Century Cracks in the Concept of Determinism," JHI 44(1983):455-475; S. G. Brush, "Irreversibility and Indeterminism: Fourier to Heisenberg," JHI 37(1976):603-630.

63. See Alvar Ellegard, "The Darwinian Theory and 19th Century Philosophies of Science," JHI 18(1957):362-393.

64. The attendant philosophic disorientation emerges explicitly in Henry Adams' desperate "Letter to American Teachers of History" (1910). See Joseph Mindel, "The Uses of Metaphor: Henry Adams and the Symbols of Science," JHI 26(1965):89-102.

65. Quoted in Hofstadter, Social Darwinism, 16. John Dewey pointed out that "the combination of the very words origin and species embodied an intellectual revolt" (John Dewey, The Influence of Darwin on Philosophy and Other Essays (New York, 1910), 1-19).

66. As John Dewey noted in retrospect, "in laying hands upon the sacred ark of absolute permanency...the *Origin of the Species* introduced a mode of thinking that in the end was bound to transform the logic of knowledge. ...The issue," he warned, "lay primarily within science itself" (The Influence of Darwin, 1,2).

67. Under such a model, as Walter Ong points out "quantity and being tend to become interchangeable" ("Psyche...", 20). By extension "being" tends to draw farther and farther from the world of experience and to define itself through mathematical limits which have the paradoxical quality of existing only at that point at which their numerical ratios vanish. This was essentially the weakness which Berkeley perceived in Newton's model and which he exploited in constructing his idealist response. For a dissenting view see J. W. Garrison "Newton and the Relation of Mathematics to Natural Philosophy," JHI 48(1987):609-626).

68. Henry Guerlac points out that "there is but a single passage suggesting concern for living matter" in the 1687 edition of the *Principia* ("Theological Voluntarism and Biological Analogies in Newton's Physical Thought," JHI 44(1983):219-229).

69. Peter Bowler points out that the word "evolution" did not acquire its current meaning in English until well

into the 19th Century, in fact until after the battle over Darwin's theories had raged for a decade or more ("The Changing Meaning of Evolution," JHI 36(1975):95-114).

70. For a discussion of Locke which highlights these tensions in his methodology see James Farr "The Way of Hypothesis: Locke on Method," JHI 48(1987):51-72 and Laurens Laudan "The Nature and Sources of Locke's Views on Hypotheses," JHI 28(1967):214.

71. Walter Ong calls the Mills' logic a "savage logic learned from associationism and brooking absolutely no interference, stat[ing] bluntly that predication itself -- that is -- any conceivable human statement whatsoever -- does no more than mark the order of trains of thought" ("Psyche...", 22). Mill's view of hypothesis rested on three Lockean principles: any general conception expresses a mental representation of an entire class of individuals; no general conception is furnished by the mind until it is furnished to the mind; and a general conception never precedes analysis (Logic, II, 190, 191, 193). "Induction," he claimed, "is proof" and hypothesis has no "place" in induction (Ibid., I, 314). Thus, although Mill loudly praised Darwin's theory as "an unimpeachable example of a legitimate hypothesis," he immediately qualified his praise with the condescending observation that Darwin, of course, had not been "concerned with the conditions of proof...[since] he was not bound by the rules of Induction, but by those of Hypothesis" (Ibid., I, 353).

72. Whewell based his Philosophy of Inductive Science (1840) on three distinctly non-Lockean arguments: the historical relativity of theory and fact; the constructive role of controversy in the progress of knowledge; and the indispensable role of hypotheses in the process of discovery. In his later Philosophy of Discovery (1849), Whewell developed this position into a full-fledged theory of logic which validated hypotheses as additive notions. Renamed "Colligations of Facts," Whewell's hypotheses were "supplied by the mind in order to bind the facts together," and actually drove the inductive process (for the complete argument, see Discovery, Chapter 22). Whewell's account had the obvious advantage of being able to accommodate Darwinian theory. (Scientific truth, he claimed, "is progressive" (Ibid., 343).) Moreover his view on causation allowed for the introduction of notions of force. ("Force," he argued, "is a quality not identical with events, but disclosed by means of them" (Inductive Science, I, 170).) Nevertheless, as C. J. Ducasse points out, the popularity of Mill's Logic prevented a general recognition of the merits of Whewell's theory. "Disregard of its merits," he claims, "was the easier because of its sharp break with the traditions of British empiricists" ("Whewell's Philosophy

of Scientific Discovery," Philosophical Review 60(1951):56). For a detailed discussion of the debate see E. W. Strong, "William Whewell and John Stuart Mill: Their Controversy About Scientific Knowledge," JHI 16(1955):209-231.

73. Adams, Oeuvres, XI, 31.

74. Unlike Darwin, Lamarck argued that habits became organized as instincts under the operation of the structural characteristics of the organism. These structures determine "an inclination towards the actions [which], becoming habitual, have occasioned the development of the organs which execute them" (Zoological Philosophy, trans. Hugh Elliot (London, 1914), 11). By contrast, Darwin argued that "habits give structure, therefore habits precede structure, therefore habitual instincts precede structure" (Second Transformation Notebook transcribed by Gavin de Beer Bulletin of the British Museum of Natural History 2(1960), 106). For his part, Comte adopted a Cartesian ideal by explicitly rejecting any referential claim for logic. "Ideas govern and revolutionize the world," he declared and proceeded from that simple dictum to outline a program whereby logic could provide a systematizing framework for knowledge. The fact that logic enjoyed no objective dimension in fact gave it its organizing power, he claimed in *La synthèse subjective*. "Thus understood," Etienne Gilson observes, "Comte is a new Descartes" (Recent Philosophy: From Hegel to the Present (New York, 1962), 273).

75. In a curious inversion of Cartesian metaphors, Bergson presented a philosophic rationale for evolution in which intuitive perceptions disclosed an objective process of "becoming." According to Bergson, time functioned in two separate modes: the "mathematical fictions" of physics and the sequential flow of "lived time" (*temps vécu*). The first was conceptual, the second intuitive. Like Descartes, Bergson claimed the superiority of the latter. But unlike Descartes he claimed that the intuitive perceptions of "lived time" could support conceptual analysis by providing an appreciation of the perceptual flow which made up existence. Through an appreciation of "lived time" man gained an intuitive insight into the continuous operation of an "élan vital" which generated the natural world. Bergson thus defined evolution as a creative process flowing from a primordial impulse perceived intuitively.

76. J. H. Randall agrees that German thought in general "found Darwin either irrelevant, or else a mere additional support" for prevailing philosophic schemes ("The Changing Impact of Darwin on Philosophy," JHI 22(1961):444.

77. For a discussion of the biological implications of "preformation" theory see Francesca Rigotti "Biology and Society," JHI 47(1986):215-233.

78. See the First Analogy of the "Transcendental Doctrine of Judgement," Critique of Pure Reason, and Prolegomena to any Future Metaphysics.

79. Nietzsche grounded causality in experience. "Our belief in causality," he claimed "is belief in force and its effect; a transference from our experience [to the world]." Causation, he claimed, is a habit of belief given objectivity by our "thinking compulsion into the process" (The Will to Power, trans. Hollingdale and Kaufmann (New York, 1968), 295, 301). Thus causal beliefs had a constructive role not only in inquiry, but in experience itself, projecting onto an objective reality the determinations of an active will. The physical world is "a sort of primitive life in which all the organic functions...are still synthetically bound up with one another" awaiting the organizing power of an effective will to give it shape and meaning (Beyond Good and Evil, trans. Marianne Cowan (Chicago, 1955), #36, #42-43). Clearly Nietzsche supplied a dimension missing from the monistic schemes of Fichte, Schelling and Hegel -- a dimension in which emergence and novelty could acquire objective meaning. For an interesting discussion of Nietzsche which relates to the present topic see G. J. Stack "Nietzsche's Influence on Pragmatic Humanism," JHP 20(1982):369-406.

80. Initially Darwinian theory provoked a reactionary response on the part of orthodox clergy, articulated against a backdrop of methodological dispute among scientists, culminating in an often incongruous accommodation between the two. F. A. P. Barnard, President of Columbia University clearly articulated the reactionary response: "Much as I love truth in the abstract, I love my hope of immortality more....If this, after all, is the best that science can give me, give me, then, I pray, no more science" (quoted in H. W. Schneider "The Influence of Darwin and Spencer on American Philosophical Theology," JHI 6(1945):4). Asa Gray of Harvard articulated the ambivalence of the scientists: "View these high matters as you will, the outcome, as concerns us, of the vast and partly comprehensible system, which under one aspect we call Nature, and under another Providence, and in part under another, Creation, is seen in the emergence of a free and self-determining personality" (Natural Science and Religion (New York, 1880), 102-3). James McCosh of Princeton displayed the adaptive instincts of the clergy, claiming that "supernatural design produces natural selection" (The Religious Aspect of Evolution (New York 1888), 7), while Henry Ward Beecher signalled their capitulation,

declaring himself a "cordial Christian evolutionist" from the most influential pulpit in the land. "Design by wholesale," he rationalized in uniquely American imagery, "is grander than design by retail" (Evolution and Religion (New York, 1885), 51-52).

81. "Evolution was eagerly accepted as a substitute religion," J. H. Randall notes. Coming at what he describes as "the psychological moment" in an "Age of Anxiety," Darwinian theory, expanded under the operation of Ramean method, provided a "cosmic sanction" for the perceived realities of American life ("Impact...", 439).

82. Persons, Minds, 241. Person's analysis identifies two distinct responses to two elements in Darwinian evolution -- heredity and environment. The first, operating under Malthusian assumptions, generated an essentially conservative response (here find Sumner and the naturalists, as well as Fiske and Abbott). The second, viewing the "struggle" for survival as an immanent process, generated an essentially liberal response (here find Leconte, Ward and Social Gospellers in general). While the distinction is instructive, however, it remains irrelevant to the present argument since both evolutionary "schools" built their models on the same philosophic ground, as the following makes clear. Furthermore, a correlative argument could be made that these two "strains" of American Darwinism drew on the two operative components of American Ramism -- *tech-nologia* and *eupraxia*. For a discussion of the ambiguities of Darwinian struggle see Peter J. Bowler, "Malthus, Darwin and the Concept of Struggle," JHI 37(1976):631-650.

83. Herein lay the fundamental difference between Spencer and his American counterparts. Spencer mixed Lockean empiricism with mechanics to develop what Bergson would later call "a false evolutionism" (Creative Evolution (London, 1907), xiv). He presented an essentially static model which equated progress with "persistence" and goals with "an impassable limit" (First Principles (New York, 1903), 369). William Graham Sumner, on the other hand assumed the evolutionary efficacy of Protestant ideals. Sumner and his disciples refused to divorce the message of evolution from the "gospel of progress." Evolution, Rockefeller claimed "is merely the working-out of a law of nature and a law of God" (Quoted in Hofstadter, Social Darwinism, 45). Moreover, not only was evolution teleological -- it was open-ended. "There is no conceivable end to [man's] march to perfection," Carnegie claimed, refuting Spencer (Autobiography of Andrew Carnegie (Boston, 1920), 327). Most significantly in the present context, American "Spencerians" retained a Ramean epistemology. Using a striking mixture of Ramean and Baconian metaphors, Sumner described experience as "a mixture of convention and



wonder, half prudence, half gambling. What we call 'brute facts'...are partly to be understood as normal events, partly as 'acts of God'" (Schneider, History, 353). This desire to preserve the rational character of the inventive intelligence and minimize fortuitous instincts clearly differentiates American from English "Spencerianism."

84. Drawing on a Jeffersonian view of biological community, the Social Gospellers constructed a reform ideology which refuted Darwinism as a conservative rationale and incorporated evolutionary theory into a program for social action. Henry George gave this "reforming Darwinism" its clearest quantitative expression in Progress and Poverty (1879) where he used a statistical approach to affirm the ability of political action to change the curve of development outlined by Malthus and Spencer. Lester Ward gave it a philosophical base in his Dynamic Sociology (1883), arguing from a distinction between *telic* and genetic phenomena to a conception of progress as a moral imperative rather than a physical law. Given fanciful expression and popular appeal in Edward Bellamy's Looking Backward, the gospel of cooperation claimed the scientific ability to change "the conditions of human life...and with them the motives of human action" (Looking Backward (Boston, 1889), 60-61). It is interesting in the present context to compare this moralistic approach to scientific reform with its French counterpart, Saint-Simonian Technocracy. For Saint-Simon, the principle of cooperation expressed a social law driven by physiological mechanisms. For George and Ward it remained a moral law grounded in psychological structure. For a relevant discussion see R. B. Carlisle "The Birth of Technocracy: Science, Society, and Saint-Simonians," JHI 35(1974):445-464. Schneider comments on the necessity of viewing reform Darwinism "as indigenous and not merely as an extension of European movements" (History, 191).

85. According to the theists, Darwin had provided an evolutionary proof of God far more potent than the Newtonian argument from design. "He who has mastered the Darwinian theory," Fiske claimed, "sees that in the deadly struggle for existence which has raged throughout countless aeons of time, the whole creation has been groaning and travailing together in order to bring forth that last consummate specimen of God's handiwork, the Human Soul" (Miscellaneous Writings (Boston, 1884), IX, 19). Evolution in fact proclaimed a gospel of good cheer which identified redemption as a promise incarnate in the objective processes of nature itself (*Ibid.*, VII, 184). Although in most cases the Christianity of the "theistic evolutionists" proved purely nominal (see particularly Frank Abbott's epistemological critique in Scientific Theism (1885)), their arguments were marshalled in support of an orthodox theology and a conservative ethic.

86. "Organic evolution," Leconte maintained, "is by *vis a tergo*, a pushing upward and forward from below and behind." In social evolution, however, growth occurred "by a *vis a fronte*, a drawing upward and forward from above and in front by an aspiration, an attraction toward an ideal." The course of history represented a dialectical interchange between the two ("The Theory of Evolution and Social Progress," The Monist 5(July 1895):492-493). Like Hegel's scheme, Leconte's theory culminated on an ideal plane. But unlike Hegel, Leconte described an indefinite social advance characterized by a "residual accumulation" of reasonableness through which the ultimate laws of nature would be fulfilled (Evolution: Its Nature, Its Evidences, and Its Relation to Religious Thought (New York, 1894), 65-66). Variants of this idealism, from "Plato Clubs" to Christian Science, reached out into American life throughout the last decades of the 19th Century. Most clearly articulated by the St. Louis Hegelians and by Bronson Alcott's version of New England Transcendentalism, these movements voiced the persistent American desire to incorporate present experience into a wider spiritual economy. More pertinent to the present context, however, is the ultimate failure of "imported" idealisms to flourish unaltered in the American intellectual milieu.

87. Substantial support exists for assuming the predominance of Puritan and Ramean paradigms in the scientific debates over evolution. Van Wyck Brooks argues for Boston as the dominant "culture-city" after Spengler's model (Flowering, 1936), 526-527), while Robert Bruce quotes a contemporary as claiming that Boston was "the only city where anything of account is done for science". Bruce points out that "it was evidently the human factor, the spirit, the values and resources of the people, that chiefly nurtured Boston science" (Launching, 32-35). Kukulick confirms this view (The Rise of American Philosophy (New Haven, 1977), xviii), while Stow Persons describes a characteristic "Protestant scholasticism" which, emanating from New England, "provide[d] intellectual stability and order" to the nation (Minds, 202). Moreover, as Daniels points out, the centering of the initial round of debates in Boston ensured that the issues would be articulated in metaphors consistent with a New England "perspective" (Jackson, 243). Only in the South, in fact, where they were "imbued with the spirit of Locke" did this dominant influence breakdown (Irving Bartlett, The American Mind in Mid-19th Century (New York, 1967), 115-116).

88. The idea of purpose, translated into an ideal of progress, displayed unique characteristics in the American context. "The American idea of progress was one intrinsically satisfied with most things as they were," Rush Welter points out. In America, progress would occur "within the

framework of the existing social order." This American perspective, which Welter calls "a habit of mind," clearly differentiated "the whole complex of American thought and behavior from that of Europe" ("The Idea of Progress in America: An Essay in Ideas and Methods," JHI 16(1955):404-405, 407). The present argument would locate the source of this "habit of mind" in a Ramean commitment to continuity.

89. "If the study of physics has taught us anything," Fiske argued, "it is that nowhere in Nature is inertness or quiescence to be found. All is quivering with energy" (The Idea of God as Affected by Modern Knowledge (Cambridge, 1887), 149-150).

90. Sumner's "folkways" expressed the evolutionary counterpart of Scottish "moral sense". As "the rules of the game" derived from experience and crystallized into laws, they provided a convenient rationale for political conservatism. But from a logical point of view, they reasserted the primacy of antecedent structure over discrete events. As symbolic renderings of environmental circumstances, Sumner's "folkways" represented a peculiarly American synthesis of a Ramean heritage and the Darwinian hypothesis.

91. Ward's "telic structures" differed from Sumner's "folkways" only in that they were functional and instrumental rather than merely symbolic. "The knowledge of experience," Ward claimed, is "a genetic product" which builds upon antecedent forms to supply rules for action under present conditions (Dynamic Sociology (New York, 1883), II, 539). It is interesting in the present context to note that Ward differentiated between biologic and telic evolution in the classic Ramean terms "natural" and "artificial" and that his description of education as "the great panacea" had clear Comenian overtones.

92. "Our reason demands that there shall be a reasonableness in the constitution of things," Fiske argued in clear Ramean images. This rational constitution, woven on "the roaring loom of Time [as an] endless web of events...make[s] more and more clearly visible the living garment of God" (Writings of John Fiske (Cambridge, 1902), 118, 188-189). The logical patrimony is patent, becoming even more so as Fiske, following Edwards, disparages the "apparent antagonism between Science and Religion" and argues for the "epic of nature" as a palpable path to objective truth (Outlines of Cosmic Philosophy (London, 1874), I, 184).

93. According to Leconte, no evolving form was entirely new. "There is always a residuum, which accumulating throughout geological times, goes to form the cycle of

the earth's life and development" ("The Natural Law of Circulation," Proceedings of the California State Teachers Institute, Sept. 13-16(1871): 66, 62). Leconte's "residuum" clearly differentiated his developmental scheme from that of Lamarck and, in the absence of any cogent genetic theory, from that of Darwin also. Evolution, he maintained, was merely "a law of derivation" ("Theory of Evolution...", 487). Again, the controlling metaphors, as well as the synoptic focus, are clearly Ramean.

94. Louis Agassiz, "Evolution and the Permanence of Type," Atlantic Monthly 33(1874):95.

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Chapter 9  
RAMUS, LEIBNIZ AND PEIRCE:  
Metaphors of Continuity  
in  
Pragmatic Thought

By the 1870's, when Charles Peirce applied himself to the task, several American theorists had already supplied important negative critiques of traditional logical models. But none seemed able to shore up their critique with a positive program sufficiently flexible to support both their individual philosophic concerns and the methodological demands of evolution. Evolutionary models contained an element of rudimentary contingency which seemed impervious to logical analysis. As Francis Bowen put it, "the tendency of Mr. Darwin's theory...is to enlarge the domain of what is...arbitrary and contingent. ...[He] denies that the same physical antecedents are always followed by the same consequents; he affirms that irregular and unexpected variations are perpetually interrupting the chain of orderly succession."<sup>1</sup> Chauncy Wright attempted an analytical explanation of these variations in his discussion of the Unconditioned, but ended by employing the whimsical image of "cosmical weather" to accommodate it to his

philosophy. His confusion before the randomness explicit in Darwinian theory emerged in a tortured equation which he gave as "the precise formula" for determining its impact.<sup>2</sup>

Wright's attempt to calculate the operation of random factors through the absolute variables of a mathematical equation expressed the essence of the methodological dilemma faced by logicians as they wrestled with the theoretical implications of Darwinism. For the logical analog of contingency is probability, not arithmetic. And although previous empirical philosophies had acknowledged the importance of probability, none had inquired into the logical or analytical relations which governed its operation. Bacon, for instance, had invoked a rudimentary form of probability in his Tables of Presence and Absence as well as in his gradualist interpretation of "prerogative instances."<sup>3</sup> Similarly, Locke had acknowledged the importance of probable relations but had declared analogy as their "great rule," thereby neutralizing their potential impact on science.<sup>4</sup> Of all the empiricists, only Hume seemed to have a mathematical conception of probability, but he limited its operation to those verifiable physical events which could be quantified.<sup>5</sup> Significantly, all these theories remained non-additive -- that is, they had no means of accounting for the impact which one probability statement had on another. Hence, they could provide no mechanism for reckoning the cumulative aspects of develop-

ment which stood in need of logical justification after 1859.\*

The natural laws which had underwritten Enlightenment science had existed outside of space and time on a plane of absolute mathematical certainty.<sup>7</sup> The copula linking their constituent parts had thus found adequate expression in the equal sign and the verb to be. But evolution demanded a new logical grammar controlled by partial conjunctions which could express the manifold existential relationships it described. It demanded a modal logic which could give full scope to the constructive aspects of development and yet provide an objective reference for the heuristic process it implied. In many ways, it required an inversion of mental attitude curiously congruent to a Ramean logical paradigm.

Colonial Ramists had trafficked in cognitive relations. They had explicitly defined inquiry as "discourse" -- that is, as a methodology akin to grammar which assumed rather than verified its constituent terms and concentrated on determining the semantic relationships which governed them. Ramism construed inquiry as a means to determine the connections which pertained between the content of logical *loci*. Its processes of invention and collocation served to arrange terms in objective patterns which the mind assessed against cognitive "templates" through the operation of judgement. These "templates," which structured man's

innate rationality, contained not only the outlines of providential design, but the accumulated wisdom of the race, stored for recall through inquiry.

Moreover, Ramism supplied a logical mechanism for expressing the adaptation of means to ends which lay at the heart of the evolutionary process. Ramist *eupraxia* could easily extend its principles to encompass the functional relationships which Darwin suggested between an organism and its environment. And *technologia* could provide a convenient framework within which to analyze biological change as a function of a permanent process. The Ramean substructures which supported American intellectual life thus had the potential to provide a philosophic platform for a processive theory of inquiry appropriate to a Darwinian world-view.

But the controlling metaphors of Ramean logic had been spatial. Under Ramean method, discourse had aimed primarily at providing a "map of the mind" -- a diagrammatic representation of the contents of consciousness which could govern the disposition of terms. Significantly, the relationships among those terms, while objective, remained static. They had no temporal reference. Evolutionary doctrine, by contrast, effectively subsumed all relationships under the notion of process. It placed all phenomena, including causation, in a temporal frame.<sup>8</sup> Evolution, in effect, demanded not only a map of the mind, but a history



as well. American theorists thus needed to accomplish a fundamental shift in metaphors before they could adapt their logical heritage to the demands of the new science. They needed to invest their static spatial analogies with a temporal dimension.

This was precisely the methodological task which Charles Peirce undertook in his cognitive theories, which set forth a processive theory of inquiry conceived as propaedeutic to a realist reconstruction of science. Peirce's logical theories established American logic in a trajectory which would carry it well into the 20th Century. In the present context, they also serve to demonstrate the persistence of Ramean metaphors in the substructures of American thought.

Peirce came upon his analysis peculiarly well-conditioned to grasp both its philosophic content and its logical scope. Born into what Van Wyck Brooks has called "the younger generation of 1849," Peirce matured in an intellectual atmosphere saturated with the philosophic concerns of a Puritanism declining into reaction.<sup>9</sup> It is significant in the present context to note that Peirce, alone among the later pragmatists, received no education abroad but developed his thought entirely within the confines of New England. Although he travelled extensively with the Geodetic Survey in pursuit of a livelihood and read widely across continental sources, his philosophical development

proceeded almost exclusively within the intellectual orbit of Cambridge.<sup>10</sup> Reared in a heterodox home where scientists of the stature of Agassiz, Gibbs and Gray frequently joined Longfellow and Emerson in lively debate, Peirce absorbed the eclectic biases of a generation of self-conscious provincials who perceived as their revised errand the task of leading America forward to an indigenous culture.

Peirce's family had intimate ties with Harvard, where his grandfather had been Librarian and institutional historian. His own father, a remarkable scholar steeped in mathematical lore and Unitarian theism, held chairs there throughout his career, as did his brother. During his youth, Charles enjoyed the best that the Harvard tradition had to offer and reaped the mature fruits of its intellectual atmosphere. Indeed until 1879, when he left for Johns Hopkins, Peirce remained immersed in the Harvard milieu. By the time he left its controlling influence, he had substantially matured as a thinker. Moreover, after Peirce left Baltimore, one scholar points out, he "lived in almost total isolation. Although he kept up a large correspondence and followed the journals at least sporadically, he was not in direct contact with the men who were doing new and exciting work even in his own fields."<sup>11</sup> This intellectual isolation probably served to intensify and deepen Peirce's reliance on those models which had

governed his early intellectual life -- models which the present argument would identify as Ramean.

Charles frequently acknowledged his intellectual debt to his father, claiming "if I do anything it will be his work."<sup>12</sup> A brilliant mathematician who held chairs in mathematics, natural philosophy and astronomy, the elder Peirce also held strong views on the religious implications of science and expounded a philosophy which, like that of Colonial Ramists, claimed a special adaptation of the human mind to nature. He believed that knowledge of nature gave insight into God's purposive plan and that inquiry and faith traced coordinate paths to truth. "The mind of man and that of Nature's God must work in the same channels," he argued, explicitly identifying the pursuit of science as a correlary of religious duty.<sup>13</sup> A proponent of the nebular hypothesis, he also subscribed to a pre-Darwinian view of cosmic evolution which maintained the action of a creative force in the initiation of a developmental process whose subsequent progression occurred according to universal laws.

Under his father's tutelage, Peirce honed his substantial analytical powers on a rigorous regimen of logic, mathematics and theory, and by the age of 25, had succumbed to an intense preoccupation with logic which would shape and direct his thought throughout his life. Thomas Goudge describes how Charles, while "still of tender age,...was

given a table of logarithms, with one example of how to use it to find the logarithm of a number, and another to illustrate the multiplication of numbers by logarithms. Beyond that the boy had to fend for himself in the matter."<sup>14</sup> Peirce himself relates how his father would require that he repeat the demonstrations of various philosophers and then "in a very few words would usually rip them up and show them empty."<sup>15</sup> "From the moment when I could think at all," Peirce claimed from the vantage point of 40 years, "I have been diligently and incessantly occupied with the study of methods [of] inquiry, both of those which have been and are pursued and those which ought to be pursued."<sup>16</sup> "It was the topic to which he looked for the most enlightenment in philosophy," James Feibleman notes. "He studied all the logic he could find and probably read more books on the subject than any other student of his day."<sup>17</sup>

Peirce developed his own logic as a systematic reaction to European logical models -- a task for which his idiosyncratic background had prepared him well.<sup>18</sup> Deeply read in continental sources and trained in critical analysis by his formidable father, Peirce demonstrated his analytical skills in a series of methodological critiques which early betrayed the distinctly American character of his thought.<sup>19</sup> In 1860, with the revealing invocation "I pray thee, O Father, to help me regard my innate ideas as objec-

tively real," Peirce embarked on a philosophic odyssey in search of a method which could bring the increasingly urgent demands of experimental science into conformity with the conceptual demands of his own intellectual heritage.<sup>20</sup> "Science [had] hitherto been proceeding without the guidance of any rational theory of logic," he would write later in life. "In my opinion, the time [had] come when it ought to be provided with a logic."<sup>21</sup> Turning first to a commentary on Kant, then to a critique of British empiricism and finally to a rejection of Cartesian psychologism, Peirce had arrived by 1877 at a characteristic theory of inquiry which would survive the many tortured turns his philosophy would take over the course of his career.

Peirce's later thought, which one can quote to support a variety of positions, can in fact be separated biographically from his earlier works in logic considered here. The years between 1859 and 1879, a period which qualifies as "formative" for Peirce, found him confined almost completely within the Cambridge intellectual milieu. But in 1879, less than a year after completing his crucial *Illustrations of the Logic of Science*, Peirce left Cambridge for Baltimore where, presumably, a wider range of philosophic influences came to bear on his thought. Significantly, however, Kuklick points out that when scholars look to Peirce for logical insights, they go "almost exclusively to the published series of works that Peirce pro-

duced in the 1860's and 1870's." Boler concurs, adding that the logic developed during this period "does not drop out of his writings at all; on the contrary, it gains increasing prominence."<sup>22</sup> The present argument, of course, gains force by accepting the chronology of Kuklick and Boler, since those works written before 1879 provide the strongest evidence for the persistence of Ramean models.

As early as 1859, Peirce began transforming Kantian categories into his own triadic conception of reality. In *Axioms of Intuition After Kant*, he fused Kant's "space" and "time" into a characteristic notion of a "third dimension." In 1865, in his seventh *Harvard Lecture*, he related Kant's categories directly to issues in the logic of science. In 1866 he laid out his own *Method of Searching for the Categories*, which led him a year later to his *New List of Categories*, considered by Peirce himself as his "one contribution to philosophy ...the gift I make to the world."<sup>23</sup>

The key to Peirce's Kantian critique lay in his insistence on the central role of sign relations in the structure and function of arguments, an inquiry to which he "devoted more labor...than to any other single field of research." By insisting that all reasoning consisted in sign relations, Peirce in a sense went *behind* Kant's categories to examine the structural elements which underwrote their validity. In doing so, he neutralized the central Kantian notion of the *ding an sich* and replaced it

with his own notion of reality grounded in relation. "The great and fundamental secret of the logic of science," Peirce claimed, is that "there is no term, properly so called, which is entirely destitute of information." Hence "there can be no conception of the absolutely incognizable, since nothing of that sort occurs in experience." In 1871 he pointed out that his own idea of reality was "instantly fatal to the idea of a thing in itself."<sup>14</sup> Like Miller's good Puritan, Peirce declared that "*cognizability...and being* are...synonymous terms."<sup>15</sup> The result, Feibleman claims, "was the complete objectification of the Kantian system."<sup>16</sup>

Peirce focused his critique of British empiricism on its associationist assumptions, which denied the shared elements of experience essential to Rationalism. He declared Locke's psychological critique "wholly inadequate and false," and argued, against Mill, that logic must extend to those "circumstances [which] are not within the range of our experience." Significantly, he identified Whewell as "the most profound [English] writer upon our subject," saying that his works contained "at least the possible germ of a strictly logical doctrine of induction." Comte he described as "helplessly restricted to a single intellectual point of view, while Mill, about whom "the worst thing to be said...is that he is an admirer of August

Comte," he accused of falling victim to a *petitio principii* through his excessive reliance on association.<sup>27</sup>

Pointing out "the peculiarities of the English mind," Peirce criticized the empiricists as "a somewhat insular group of thinkers...[whose] chief methodological characteristic...is the application of Ockham's razor...to everything which looks like a metaphysical superfluity." Associationism, he claimed "has nothing to do with logic whatsoever," repeatedly referring to the "peculiar lines of thought" which ran through English logic as a "certain family resemblance" grounded in a "nominalistic tendency."<sup>28</sup> His critique culminated in the 1871 *Review of Fraser's Berkeley*, which consolidated his position into a fully articulated allegiance to a realism grounded in consensual knowledge.

But Peirce reserved his most devastating critique for Descartes. "If Kant was his teacher, and Duns Scotus his friend," Feibleman claims, "Descartes was his adversary."<sup>29</sup> Peirce launched a major offensive against Descartes' psychologism in three articles which appeared in the Journal of Speculative Philosophy beginning in 1868.<sup>30</sup> In the first, Peirce redefined Cartesian intuition and introspection as mediated inferential processes. In the second, he mounted an attack on the Cartesian pretension to universal doubt and innatism. Descartes, Peirce claimed had mistakenly confined reasoning to "a single thread of



inference depending upon inconspicuous premisses," ignoring the fact that inference "derives its validity from its combining the character of induction and hypothesis" (*pace* Bacon and Ramus!).<sup>31</sup>

Peirce reenforced this position in the third article in the series, which defended the syllogism on the purely Wolffian grounds that "the relation between syllogism and thought does not spring from considerations of formal logic, but from those of psychology" -- that is, from the natural structures of the mind. He recapped these arguments in his *Lessons in Practical Logic* in 1869 where, significantly, he quoted Peter of Spain in his own defense. "It would be difficult indeed to overstate the importance of these three papers in the Peircean corpus," Fisch claims.<sup>32</sup> The present argument would certainly agree, since they led directly into the arguments presented in his *Illustrations of the Logic of Science*, for which they provide a curiously Ramean backdrop.

Scholars, encouraged by Peirce's own admission that as "a babe in philosophy [his] bottle was filled from the udders of Kant," as well as by the tenor and sheer volume of textual references, have generally given Kantian philosophy priority in discussing the origins of Peirce's thought.<sup>33</sup> Research by Max Fisch, however, suggests an interesting dimension to Peirce's abundantly analyzed

ambivalence toward Kant -- a dimension which has special relevance for the present argument.

Fisch argues for a determining influence on Peirce's thought by the writings of Leibniz. "The name of Leibniz was familiar in the Peirce household and in the Cambridge of his youth," he points out. "His father was a leading member of the Cambridge Scientific Club, which had several meetings on Leibniz." Moreover, Fisch notes, throughout Peirce's college career -- that is, before and during that time during which scholars normally portray Peirce as immersed in Kant -- Benjamin Peirce was preparing and publishing his *Analytic Mechanics*, which "contained an appendix arguing for a return to Leibniz' position on the force of moving bodies." In 1876, just before Peirce began his *Illustrations*, Benjamin published his last work, "A New System of Binary Arithmetic," which he compared step by step with Leibniz' system.<sup>34</sup>

It seems likely, in the light of Fisch's observations, that Leibniz would have been a regular topic of sympathetic debate in the Peirce household during an important phase of Charles' intellectual development -- a phase which led into his critique of Kant. Fisch suggests that "while accepting without change scarcely any of his positive doctrines, Peirce identified himself more closely with Leibniz than with any other thinker." Leroy Loemker lends support to Fisch's argument, claiming that Peirce "knew Leibniz better

than any other American of his time."<sup>35</sup> Indeed, not only did Peirce's exposure to Leibnizian logic preceed his exposure to that of Kant, Fisch claims, but Peirce's reading of Kant in fact proceeded in the context of "the literature in the light of which it was to be understood; especially...Leibniz and Wolff."<sup>36</sup>

"Peirce was no Kantian," Feibleman agrees, pointing out that Kantian philosophy remained "a discipline rather than a revelation of the truth" to Peirce and served him primarily as a negative example. Nor, he adds, did Peirce emerge as a neo-Kantian. "While [he] owed much in the formation of his philosophy to the influence of Kant, the result was not Kant's philosophy nor even that of a good Kantian." "In this distinction," he argues, "is contained the key to the understanding of much in Peirce's whole position."<sup>37</sup> Kant's *Critique*, although at first praised by Peirce as "perhaps the greatest work of the human intellect" was ultimately rejected as "in reality nothing more portentous than a sickly little nanny-goat masquerading as a world-shatterer," while Leibniz, by contrast, remained "the Columbus of the subconscious mind." "The reasoning of Leibniz," Peirce claimed, "was nearly, if not quite, of the highest order, being far more accurate than that of Kant or almost any metaphysicians that can be named." Kant, although "constituted by nature a great logician, [was] not indeed to be compared with Leibniz, who

in his later years, in his infinitesimal calculus, in his law of continuity...soared high above his earlier nominalism."<sup>38</sup>

Fisch conjectures that Peirce's persistent and outspoken preference for Leibniz over Kant may well mark his "first steps from nominalism toward realism."<sup>39</sup> Indeed Peirce's fascination for scholastic realism, and for Duns Scotus in particular, dates from precisely the period which Fisch describes.<sup>40</sup> Peirce turned to Scotus after, and in reaction to, his study of Kant and it was in his reading of Scotus that he found justification for his own logical program. "Pragmatism," Peirce himself later pointed out, "could hardly have entered a head that was not already convinced that there are real generals."<sup>41</sup> By 1868, Peirce was ready to identify his position with scholastic realism and, by 1869, had identified that realism with the concept of continuity. By 1871, he had explicitly identified his own logic of science with Scotist realism and had concluded that "science has always been at heart realistic, and must always be so."<sup>42</sup>

All these factors lead Fisch to claim that, in certain respects, Peirce's pragmatism "was a matter of going on from where Leibniz left off."<sup>43</sup> If Fisch's reading of the documents is correct, Peirce's enduring sympathy for "the glorious logical strength of Leibniz" may have important implications for the current argument, which would further

claim that this affinity in fact rested on deep-seated resonances between Leibniz' "great principle of continuity" and Peirce's own native Ramean heritage.<sup>44</sup>

*Synechism*, "or the principle of universal continuity...which is involved in all existence," played a central role in Peirce's thought.<sup>45</sup> "We ought to assume things to be continuous as far as we can," Peirce insisted.<sup>46</sup> In fact, he identified his own intellectual errand as the task of "carrying the idea of Continuity into all parts of philosophy."<sup>47</sup> As early as 1867, Peirce propounded a theory of continuity similar to Leibniz' own.<sup>48</sup> In 1868, he reiterated that principle in three papers on the validity of the laws of logic.<sup>49</sup> In 1884, he again endorsed continuity, attributing the principle directly to Leibniz and in 1899 claimed, in a review of Renouvier's *La Nouvelle Monadology*, that the principle of continuity "would form the basis of a philosophy in deepest unison with the ideas of the last half of the 19th Century."<sup>50</sup> Indeed as late as 1893, Peirce was still articulating a theory close to Leibniz' in a discussion of the evolution of natural laws.<sup>51</sup> His later interest in topical geometry, existential graphs, and semiotics all maintained this persistent commitment to continuity.<sup>52</sup> Peirce's entire phenomenology in fact had harmonics in a Ramean logical paradigm.

Although Peirce did not articulate his phenomenology, or *phaneroscopy*, until around 1900, indications of it appear in his thought as early as 1867, during that period in which Fisch describes him as "under the influence" of Leibniz. And Peirce's *phaneroscopy* in fact contains clear echoes of Ramean metaphors. The Ramist ideal of an accessible order totally within the ambit of the conscious mind emerged in his definition of philosophy as "an experimental science, resting on that experience which is common to us all." Truth is only necessary, Peirce argued, "in the sense that all the world knows beyond all doubt those truths of experience upon which [it] is founded." For Peirce, as for Ramus, philosophy, as "the most primal of all the positive sciences" rested always on the Ramean presuppositions that the *phanera* remained fundamentally the same for everyone, and were completely accessible to rational inquiry.<sup>53</sup>

The conceptual congruences between Peircean and Ramean logic extend as well to Peirce's theories of classification and communication. One need only insert the word "place" to make Peirce read like a Ramist when he defines a natural class as "a family whose members are the sole offspring and vehicles of one idea." His description of classification as "a kind of Argument by which general ideas are attached to the objects of experience," as well as his claims that thought "invariably needs something like a diagram" or "tabular array of familiar symbols" to make itself clear

all employed explicit Ramean images. His faith in the argument as the fundamental logical form, his designation of judgement as the source of "leading principles," and his reliance on the intermediate step of colocation all echoed Ramean metaphors. Moreover, Peirce, in his semiotic, hoped to resuscitate the Ramean discipline of "Speculative Rhetoric" as "the highest and most living branch of logic."<sup>54</sup>

It is difficult, however, to demonstrate substantive ties between Ramean logic proper and Peirce's philosophy. The *Collected Papers* contain only three references to Ramus, while Fisch's *Chronological Edition* adds only three others to date. Fortunately for this author, Fisch has completed his *Chronological Edition* through 1878, the year in which the final *Illustration* appeared. The material contained therein can thus be construed as indicative of those Ramean factors which might have effected the formation of the argument Peirce makes in these crucial essays.

Unfortunately, the references are scattered and ambiguous. In one included in Fisch's edition, Peirce brackets Ramus with Kant as a reformer in logic and science; in another he links him with Cicero and comments (negatively) on his rhetorical focus; in a third he links Ramus with Agricola and "the peculiarities of the humanist mind. In this same passage, however, Peirce significantly accuses Bacon and Locke of "putting aside the old syl-

logistic and topics as though they contained something false, instead of being only incomplete.<sup>55</sup> In two of the references contained in the *Collected Papers*, Peirce shows some familiarity with Ramean texts themselves and includes Ramus in an etymological account of the Kantian term *Kritik*. In the third, he describes Ramus as representative of "a new awakening" which brought "rather important things to the tradition of logic." Here he ranks Ramus with Vives and Valla.<sup>56</sup> In a later reference in a review of Greenslet's *Joseph Glanville*, Peirce credits Ramus with "attacking Aristotle in large round style" and links him with Giordano Bruno.<sup>57</sup>

Yet in the present context, even this meager evidence proves significant. The fact that a logician of Peirce's stature would decline to analyze in depth the texts of a logician of Ramus' stripe is not surprising. But the references show that Peirce, through his extensive readings, had become familiar with Ramean models -- something which probably could not be said of most of his contemporaries. Significantly when the editors of the *Century Dictionary* needed entries on "Ramism" and "Ramist," they turned to Peirce, whose subsequent contributions described Ramism as a logical system "characterized by simplicity and good sense, [which] was set forth with some literary skill."<sup>58</sup>



Indeed, Peirce's education and family background make it almost inconceivable that Peirce could have escaped some contact with Ramean texts in his early methodological inquiries. And the fact remains that Peirce found occasion to mention Ramus several times in his writings without seriously attacking him -- a privilege not enjoyed by most other logicians. Moreover, Peirce's sympathies for the philosophical implications of Ramism, though unattributed, emerge clearly in his own methodological orientation and in his adoption of those elements of Leibniz' thought which represent survivals of the Ramism which underwrote the German models discussed above.

Peirce declared his methodological affiliation early on in a note which described "two methods of viewing metaphysics which give rise to two methods of treating it. One starts by drawing the conceptions from logical relations and thence reasoning to their place in the mind; the other starts by drawing the conceptions from the system of psychology and reasoning to their logical meaning. The former," he decided, "seems to me, if less psychologically exact, to be more metaphysically true in its results, and it is the method I adopt."<sup>59</sup> This methodological commitment, with its clear Ramean overtones, remained firm throughout Peirce's career.

The tie between Ramus and Peirce resides in fact in biography, not bibliography. Absorbed as a latent value

system through the Cambridge intellectual milieu, his father's philosophical biases and the educational atmosphere of 19th Century Harvard, Peirce's "Ramism" appears in his writings as a commitment to those realist substructures which had governed American intellectual life since the founding of the City. His entire cosmology, with its explicit defense of "cosmic reasonableness" and "collective wisdom," rests upon an ontology which, like Ramus' own, acknowledged the reality of the shared elements of human experience.

Peirce held that logic comprised "the traditional experience of mankind." Thus it not only controlled inquiry, it revealed the actual structure of reality itself. These functions merged in the science of semiotic, which began with the Ramean assumption of a universe held in common through experience. Semiotic incorporated under its principles "the total everyday experience of many generations of multitudinous populations."<sup>60</sup> Fisch claims that Peirce had committed himself to a semiotic view as early as 1868 and was, at his death, still hard at work on 'A System of Logic Considered as Semiotic'. In fact, Fisch places all Peirce's work in logic within a semiotic framework.<sup>61</sup> But this extension of logic to semiosis drew on directly on Peirce's affinity for medieval logicians, Peter of Spain among them.<sup>62</sup> Moreover, it had harmonics in Peirce's Ramean heritage, where the crucial doctrine of the *logos*

provided it with a platform, as well as in the Comenian tradition which had remade German logic in the Ramean image -- an influence which in turn came to bear on Peirce through Leibniz.

Paul Conkin characterizes Peirce as one of "the last spiritual children of Puritan New England," a latter-day Saint who sought principles of rational order which would ultimately illuminate the purpose of the natural world.<sup>23</sup> Drawing on powerful metaphors embedded deep in his intellectual heritage, Peirce set out to develop a logical system which could heal the rift between fact and form caused by science in the modern world. Like a good Ramist, he attempted in his logic to construct a probative framework within which a cognitive covenant could link conduct and concept through a bond of meaning. This covenant, articulated most clearly in his *Illustrations of the Logic of Science*, proved to be one of the most enduring elements of Peirce's shifting and often paradoxical thought.

## CHAPTER NOTES

1. Francis Bowen, "Review of Darwin's *Origin of the Species*," North American Review 90(1860), 506.

2. "The living forces of all moving bodies, *minus* the potentials of their forces of gravitation, *plus* the mechanical values of their heat, *equal* to a constant quantity" (Philosophical Discussions (New York, 1877), 19).

3. NO, II, xxii in Works, I, 268.

4. Locke, Essay, IV, xvi, 12.

5. Hume, Treatise, I, iii, 6.

6. Bayard Rankin presents a relevant discussion of probability in "The History of Probability and the Changing Concept of the Individual," JHI 27(1966):483-504. Drawing on distinctions between the classical figures of Tyche and Moira, Rankin describes probability as an analytical correlate of a dynamic interaction between the individual and its statistical counterpart, the population. "The problem of Tyche and Moira," he claims, relates to the theoretical problems which emerge in quantum mechanics and is in fact "prophetic in emerging into the realm of ideas long before scientific instruments could probe it and long before scientific thought could cope with its intricate nature" (Ibid., 490). Rankin focuses his discussion on probability theory as it relates to changing conceptions of the individual and consequently ignores the wider issues implicit therein. The present argument, however, would interpret Rankin's "population" as "community" and extend his observations to include the question at hand. Peirce's use of the terms "tychism" and "tychistic" make the extension particularly apt.

7. For a discussion of natural law which has implications for the present question see Leonard Krieger, "Kant and the Crisis of Natural Law," JHI 26(1965):191-210.

8. Kant had attempted to address a similar logical issue by bringing causality under the categories of experience, but he had ultimately been driven back through a logical regress to an incognizable *Ding an sich* which precluded "scientific" knowledge of hypothetical forms -- knowledge which a later generation of theorists demanded. Empiricists could accept Kant's logical compromise in exchange for the protections of an unrelenting positivism. Minds trained up in the Ramean tradition, on the other hand, could not. Their innate rationality precluded it.

This was essentially the gist of Sir William Hamilton's critique of Mill -- a critique which Peirce read with great sympathy.

9. Brooks, Flowering, 180.

10. Indeed Peirce himself claimed that the New England mind "had a peculiar genius for philosophy," one to which he apparently considered himself heir. He indulged in a lengthy paean to the "subtlety and ideality of the Yankee mind," and noted, interestingly, that "the Scotch and the Germans are the peoples with whom the New Englanders ought to be compared." CE 1.455-456.

11. Murray Murphey, The Development of Peirce's Philosophy (Cambridge, 1961), 292-293.

12. CP 3.405.

13. See Benjamin Peirce: 1809-1880 - By Various Hands (Oberlin, 1925), 6 and Astronomical Journal 2(1851):19.

14. Thomas Goudge, The Thought of C. S. Peirce (New York, 1969), 327.

15. CP 3.405.

16. CP 1.3.

17. James K. Feibleman, An Introduction to the Philosophy of Charles S. Peirce, (Cambridge, 1969), 20.

18. Feibleman identifies twelve specific logical theories which Peirce sought to discredit on the grounds of their reliance on "subjective feeling, on the natural light of reason, on philosophy, on psychology, on the data of psychology, on epistemology, on philology, on the order of society, on the authority of the Church, on the history of science, on individual experience and on facts reasoned about" (Introduction, 81-84). The present argument will confine itself to the three major traditions into which these twelve theories fall -- the Kantian, the Lockean and the Cartesian -- in order to maintain the historical focus of previous chapters.

19. The principle documents are the 1864 *Treatise of the Major Premisses of Natural Science*, which describes the principles of science in Baconian terms, as a *priori* "anticipations of experience"; the 1865 Harvard Lectures *On the Logic of Science*, which investigate "the degree and character of the certainty of scientific ratiocination [and] ...primitive principles" in the context of an explicit critique of British empiricism; the 1865 *Logic of*

*the Sciences*, which traces the rough outlines of Peirce's later semiotic theories; the 1866 *Logic Notebook* which contains the significant assertion that "there is no difference logically between hypotheticals and categoricals"; The Lowell Lectures on *The Logic of Science*, with the important addendum *Or Induction and Hypothesis*, which describe logic as "a testing art" and present an indepth examination of the nature of inference; the 1866 *On a Method of Searching for the Categories* which deals with the nature of intuition and anticipates Peirce's rejection of Descartes; the 1867 *Critique of Positivism*, which identifies it as "entirely false"; the 1868 *Questions Concerning Certain Faculties Claimed for Man and Some Consequences of Four Incapacities*, which together reject Cartesian innatism and psychologism as irrelevant to the task of logic; the 1869 *English Doctrine of Ideas and Lectures on British Logicians*, which reject associationist theory as "simple English psychology"; and the important 1871 *Berkeley Review*, which refines the arguments of earlier critiques and sketches the outlines of Peirce's own later thought.

20. CE 1.xlvi.

21. C. S. Peirce to G. F. Becker, June 11, 1893; quoted in Nathan Reingold, *Science in 19th Century America* (New York, 1964), 231.

22. Kuklick, *Rise*, 125; Boler, *Realism*, 152.

23. CE 1.xxvi.

24. CE 1.xxiii; CP 3.641; CP 1.350; CE 1.465; CP 5.255; CE 2.469.

25. CE 2.208. See also CP 5.452.

26. Feibleman, *Introduction*, 37.

27. CE 1.172; CE 1.201; CE 1.211,209; CE 1.212.

28. CE 2.302; CE 1.362; CE 2.310.

29. Feibleman, *Introduction*, 69.

30. CE 2.193-2172. Fisch includes an early manuscript version under the title *Questions Concerning Reality* (CE 2.162-186).

31. CE 2.193; CP 5.265; CP 5.63; CP 5.264; CE 2.220; CE 2.268.

32. CE 2.351; CE 2.xlii.

33. CP 2.113. See also CP1.4, CP1.563. Max Fisch, on the other hand, claims that the first book in logic read by Peirce was Whately's *Elements of Logic*, devoured at the age of twelve (CE 1.xix). Goudge concurs and states that Whately "opened up the domain of logical analysis, and pointed his mind in the direction of semiotic" (*Thought*, 334).

34. Max Fisch, "Peirce and Leibniz," JHI 33(1972):485-491.

35. Ibid., 496; Leibniz, *Philosophical Papers and Letters*, trans. Leroy Loemker (Dordrecht, 1969), 57.

36. Fisch, "Peirce and Leibniz," 490.

37. Feibleman, *Introduction*, 11-12, 33-34.

38. CE 1.104; Peirce Ms 609, p.9, quoted in Fisch, "Peirce and Leibniz," 496; Review of Latta's translation of the *Monadology*, *The Nation* 68(1899):210; Peirce Ms 609, p.9.

39. Fisch, "Peirce and Leibniz," 491, 496.

40. See John Boler, *Charles Peirce and Scholastic Realism* (Seattle, 1963), 152.

41. CP 1.19, 1.560; CP 5.503. See also CP 5.423, 5.439, 5.453, 6.485, 8.208, 8.258.

42. CE 2.239; CE 2.336; CE 2.462-492; CP 1.20. In the present context, it is interesting that Feibleman identifies Reid as the second, and perhaps proximate, source of Peirce's realism (*Introduction*, 451-457; See also "Reid and the Origins of Modern Realism," JHI 5(1944):113-120). Peirce himself acknowledged his debt to Reid (See particularly CP 5.438-463 and CP 5.502-537). Reid's ties to Ramism are discussed above.

43. Fisch, "Peirce and Leibniz," 492.

44. Peirce Ms 284, p.13, quoted in Fisch, "Peirce and Leibniz," 495.

45. Peirce Ms L107, p.10, quoted in Fisch, "Peirce and Leibniz," 493.

46. CP 6.277.

47. "The 19th Century: Notes," Peirce MSS quoted in Wiener, *Values*, 261.

48. CP 2.392.
49. See especially CP 5.263, 5.267, 5.284, 5.289, 5.295, 5.311, 5.327, 5.329, 5.333-336.
50. Peirce Ms L107, p.10, quoted in Fisch, "Peirce and Leibniz," 493; The Nation 69(1899):97-98.
51. CP 8.276. Peirce called the postulate of continuity "the leading conception of science" (CP 1.62).
52. Fisch concludes that "Peirce's chief contribution to experimental psychology, as well as his mathematics, logic, and metaphysics, had Leibnizian affiliations" (Fisch, "Peirce and Leibniz," 493).
53. CP 3.560; CP 5.39. For an interesting general discussion of the relationship between phenomenological thought and logical realism see Robert J. Henle, S. J., "A Phenomenological Approach to Realism," in Gilson Tribute ed. C. G. O'Neill (Milwaukee, 1959), 68-85.
54. CP 1.222; CP 6.472; CP 2.267; CP 3.419; CP 2.619; CP 2.356; CP 2.462-465; CP 2.333.
55. CE 1.162; CE 1.163; CE 3.3.
56. CP 1.355; CP 2.205; CP 4.30.
57. C. S. Peirce, review of Ferris Greenslet's *Joseph Glanville* in The Nation 71(11 Oct 1900):295-296. In terms of the topical tradition in general, Peirce's references are numerous (some twelve in the Collected Papers and another eight in the Chronological Edition) and, on the whole, positive.
58. The Century Dictionary and Cyclopedia: With a New Atlas of the World: A Work of General Reference in All Departments of Knowledge (New York, 1909) 12 vol. Peirce's annotated set of the *Century Dictionary*, with his own contributions marked in green, are in the Houghton Library at Harvard. The entries for Ramism and Ramist appear on page 4950.
59. Fragment dated July 3, 1860, quoted in Philip Wiener, "Peirce's Evolutionism and Pragmatism," *JHI* 7(1946):325. See also CE 1.63.
60. CP 1.654; CP 2.357; CP 5.522.
61. CP 2.241; Max Fisch, "Peirce's Place in American Thought," Ars Semeiotica 1/2(1977):21-37).



62. John Deeley traces the roots of semiosis in Introducing Semiotic: Its History and Doctrine (Bloomington, 1982), tying it explicitly to Peter of Spain. But Deeley claims the most important important lines of transmission ran through Fonseca and Poincot. The present argument would trace an equally important influence through Ramus and Comenius. (It is interesting to note here that Deeley acknowledges that Fonseca's doctrines were being taught at Graz in Austria in 1615 and makes explicit ties to the Ramean tradition through Agricola (Ibid., 75, 160-161). For relevant discussions see Sandra Rosenthal, "C. S. Peirce: Pragmatism, Semiotic Structure and Lived Perceptual Experience," JHP 17(1979):285-290; T. L. Short, "Life Among the Legisigns," in Deeley, Frontiers; Charles W. Morris, (The Pragmatic Movement in American Philosophy (New York, 1970).

63. Peirce "wanted not only substance but order," Conkin claims. "His bent was ever toward complete synthesis. Like the Puritan who toiled at his systematic classification of all the arts, Peirce...classified as an act of piety, in order to elaborate the order of creation and the intentions of God." He was "Edward's first real successor," Conkin maintains -- a logician who read the cosmos as a living symbol of a divinity that wanted to be fully comprehended. Conkin, Puritans, 306, 205-206, 193.

## Chapter 10

### THE MENDING OF 'KNOWLEDGE BROKEN':

Peirce

and the

Continuity Thesis

As Fisch's chronology makes clear, by 1872 Peirce had committed himself almost exclusively to a methodological inquiry which culminated five years later in his *Illustrations of the Logic of Science*.<sup>1</sup> The *Illustrations*, which dared to acknowledge the sweeping philosophic implications of modern science, presented a cogent argument for a moderate realism recast in a scientific image.<sup>2</sup> Peirce strove therein to provide a synoptic synthesis of order and function which could serve as logical ground for both the gradualism implicit in evolution and the hypothetical inferences inherent in theoretical forms. Through a radical reformulation of experience grounded in biological function, Peirce dissolved meaning and method into alternative, though individually valid and purposively distinct, environmental responses. The resulting cognitive theory, which embraced Peirce's pragmatic maxim, made all intellectual meaning ultimately a matter of purposive action and tied existential fact to the very structure of thought.

The first *Illustration* appeared in 1877 under the title "The Fixation of Belief." Here Peirce undertook, through an analysis of the conditions of inquiry, to establish an objective ground for those "guiding principles of inference" for which he had argued in his earlier critiques. "To describe the method of scientific investigation is the object of this series of papers," he affirmed. But "since each chief step in science has been a lesson in logic," an analysis of "those rules of reasoning which are deduced from the very idea of the process itself" and which therefore "are the most essential," must precede any discussion of science. "A moment's thought will show," he argued, "that a variety of facts are already assumed when the logical question is first asked. It is implied, for instance, that there are such states of mind as doubt and belief -- that a passage from one to the other is possible, ...and that this transition is subject to some rules which all minds alike are bound by." Only by understanding the grounds of this logical "transition," Peirce maintained, could one truly comprehend the methods of science.<sup>3</sup>

"The object of reasoning," Peirce observed, "is to find out, from the consideration of what we already know, something else which we do not know." But "that which determines us, from given premises, to draw one inference rather than another, is some habit of mind."<sup>4</sup> These habits, he claimed, derived from an experiential passage

from doubt to belief which "reminds us of the irritation of a nerve and the reflex action produced thereby."<sup>5</sup> Pointing out that "we generally know when we wish to ask a question and when we wish to pronounce a judgement," Peirce argued that there must be "a dissimilarity between the sensation of doubting and believing." The first surfaced as "an uneasy and dissatisfied state from which we struggle to free ourselves," while the second emerged as "a calm and satisfactory state which we do not wish to avoid." The struggle involved in the passage from one to the other, Peirce concluded, must encompass the entire process of inquiry, a process which resulted in "there being established in our nature some habit which will determine our actions."<sup>6</sup>

The existential priority of doubt and belief in Peirce's model allowed him to argue for the habits they produced as normative principles grounded in the organic metaboly of signs. Moreover, as positive determinants to action, habits took on an objective reality derived from the verifiable processes which generated them. "Habits guide our desires and shape our actions," Peirce claimed. Elsewhere he treated them as synonymous with natural law.<sup>7</sup> In fact, according to Peirce, habits controlled the entire process by which the mind crystallized itself into a determinate world of "concrete reasonableness." In a

sense, he relied on habit to generate that perfect rationality which the Colonial Ramists had simply assumed.

Peirce's environmentally determined habits thus gave him the objective justification he sought for the guiding principles which underwrote scientific discovery. Coincidentally, they demonstrated a structural correspondence between reason and experience similar to that which had controlled the logic of Colonial Ramists. Like a good Ramist, Peirce subscribed to a logical theory congruent to the doctrine of means which interpreted ontology as a cognitive enterprise. But by identifying habit as the ultimate logical interpretant, Peirce essentially subsumed the Ramist confusion of first and second intentions under his general theory of semiotic, arriving thereby at a curious inversion of Ramist ontology which "conceive[d] Nature to be perpetually making deductions in *Barbara*." "Every scientific explanation of a natural phenomenon," he claimed, "is a hypothesis that there is something in nature to which the human reason is analogous."<sup>6</sup>

But in order to extend this analogy to the methods of experimental science, Peirce needed to tie it to a cognitive theory which could validate both the logical and the material aspects of inference. He needed to ground it in an ontology which, while relevant at the level of human action, could withstand an extrinsic test. Characteristically, he turned to the principle of continuity,

reformulated as "unlimited community," for a means by which to determine the objective validity of inferred "habits."

"The question of validity," Peirce noted, "is purely one of fact and not of thinking." Hence beliefs must "be caused by nothing human but by some external permanency -- by something upon which our thinking has no effect." He located that "external permanency" in "the conception of truth as something public" -- in a typically Ramean conviction that "the ultimate conclusion of every man must be the same." Maintaining that the principle of continuity and the intrinsically provisional "scientific method of settling opinion" expressed logically equivalent formulae, Peirce argued that "the problem becomes how to fix belief, not in the individual merely, but in the community."<sup>8</sup>

The fundamental hypothesis of science, he pointed out, is this:

There are real things, whose characters are entirely independent of our opinions about them; those realities affect our senses according to regular laws, and, though our sensations are as different as our relations to the objects, yet, by taking advantage of the laws of perception, we can ascertain by reasoning how things really are, and any man, if he have sufficient experience and reason enough about it, will be led to the one true conclusion.

"The new conception here involved," Peirce concluded, "is that of reality." In fact, as Peirce had argued in his critique of Descartes, "the very origin of the conception of reality shows that this conception essentially involves

the notion of COMMUNITY, without definite limits, and capable of a definite increase of knowledge."<sup>10</sup>

The intimate connection established here between reality, inquiry and community remained a permanent feature of Peirce's thought. He in fact based an entire cosmology on this "full and fixed connection" which, like Edwards' own, anchored moral obligation in "a wider sort of social feeling."<sup>11</sup> "The social impulse," Peirce maintained, "is rooted intrinsically in logic," reflecting environmental responses occurring at the instinctive level of life. Since the integrity of that impulse rested on the self-consistency of logic and the self-corrective of method, Peirce could argue that it transcended the peculiarities of finite data and operated at the level of science.<sup>12</sup> Moreover, by portraying cognition as the accumulation of objective beliefs which the mind instinctively rolled into habits, he could further claim that his normative principles remained within the reach of inquiry. But above all, by relocating the concept of reality in the notion of unlimited community, Peirce imparted a temporal dimension to logical forms which could accomodate the processive elements implicit in evolutionary thought.

For, in fact, the essence of Peirce's notion of "unlimited community" lay in its time-dependent structure. "The idea of time," Peirce noted, "must be employed in

arriving at the conception of logical consecution." A general inference, he argued, "cannot be fully realized. It is a potentiality; and its mode of being is *esse in futuro*." Moreover, since "there is no time in the Present for any inference at all, least of all for inference concerning that very instant, ...the consciousness of the present is...that of a struggle over what shall be; and thus we emerge from the study with a confirmed belief [in] the Nascent State of the Actual."<sup>13</sup> Fisch claims that Peirce's major contribution lay in "giving 'real' and 'reality' a forward rather than a backward reference."<sup>14</sup> The present argument would maintain that the significance of Peirce's argument lay in its giving reality any temporal reference at all.

Under Peirce's model, the process of inquiry coexisted temporally with an awareness of a changing reality. The static "spatial" dimensions of thought, while instrumental to the process, remained largely irrelevant to its ultimate goal, which aimed at a truth apprehended cooperatively over time.<sup>15</sup> Moreover, since habits, as products of the experiential passage from doubt to belief, constituted rules of procedure adopted under changing environmental conditions, they themselves partook "of the general nature of expectations of the future" and thereby retained a temporal dimension which "correspond[ed] to the idea of probability." By conceiving of reality as a hypothetical construct "con-



stituted by an event indefinitely future," Peirce accomplished that fundamental shift in logical metaphors needed to accomodate the time-dependent formulas of evolution.<sup>16</sup> Significantly, he did so in a logical context controlled by the principle of continuity -- a context which, although largely ignored by his successors, bore the unmistakeable imprint of a Ramean heritage.

In his second *Illustration*, which appeared under the title "How to Make our Ideas Clear," Peirce presented an epistemological account of how these logical principles emerged into consciousness.<sup>17</sup> In his first essay, he had developed "a method for reaching a clearness of thought of a far higher grade than the 'distinctness' of the logicians." Now, having rescued inquiry from "the rich mud of conceptions" in which the "circle-squarers" had mired it, he sought a criterion for meaning which would allow for the extension of his model to empirical analyses.<sup>18</sup> Drawing on a musical analogy, Peirce presented an argument for "mediate consciousness" which he interpreted as the methodological correlate of development.

"We have found," he reminded his readers, "that the action of thought is excited by the irritation of doubt, and ceases when belief is attained." Thus doubt, "however [it] may originate ...stimulates the mind to an activity [in which]...images pass rapidly through consciousness, one incessantly melting into another, until at last...we have

attained belief." But in this "activity of thought," Peirce claimed, there subsisted "two sorts of elements of consciousness" which he defined as "immediate" and "mediate."<sup>19</sup> Likening the first to a single tone which is "completely present at every instant" and the second to an air which "consists in an orderliness in the succession of sounds," Peirce extended his analogy to describe thought itself as a relational complex -- "a thread of melody running through the succession of our sensations." Cognition, he argued, must therefore define a "system of relationships" which revealed "a congruence in the succession of sensations which flow through the mind." Hence "there must be some continuity of consciousness," he concluded, "which makes the events of a lapse of time present to us" and thereby drives the process by which prereflective impressions become habits.<sup>20</sup>

The principle of continuity thus underwrote both Peirce's theory of truth and his related theory of cognition. Through it, he established the coalition between logical meaning and practical purpose which would inform the rest of his *Illustrations*. Since "the whole function of thought is to produce habits of action," he argued, "it is absurd to say that thought has any meaning unrelated to its function." Consequently, "what a thing means is simply what habits it involves; ...and there is no distinction of meaning so fine as to consist in anything but a possible

difference of practice" -- a difference perceived through that "congruence in the succession of sensations" which structured thought. Peirce articulated the rule of procedure here involved in the now familiar "pragmatic maxim":

Consider what effects, which might conceivably have practical bearings, we conceive the object of our conception to have. Then, our conception of these effects is the whole of our conception of the object.<sup>21</sup>

On this maxim Peirce would ground the distinctive equation of process and reality which extended his cognitive theory to ontology.

"Reality," Peirce suggested, "like every other quality, consists in the peculiar sensible effects which things partaking of it produce." Since "the only effect which real things have is to cause belief," the ontological status of any phenomenon must depend on the mind's activity in distinguishing false from true beliefs. In other words, it depended on "how we think," not "what we think." But, as Peirce had established in his first essay, "the question of validity [was] purely one of fact" and therefore "appertain[ed] exclusively to the scientific method of settling opinion." Since he had already identified the "external permanency" which underwrote that method as "something public," Peirce could, by extension, define reality as "predestinate opinion." "The opinion which is fated to be ultimately agreed to by all who investigate,"

he intoned, "is what we mean by the truth, and the object represented in this opinion is the real. That is the way I would explain reality." Having forged this cognitive link between meaning and truth, Peirce was prepared to "cross the threshold of scientific logic," a step he took in his next two *Illustrations*, "The Doctrine of Chances" and "The Probability of Induction."<sup>22</sup>

Peirce began his third essay with the observation that, although "science first begins to be exact when it is quantitatively treated," it is "not so much from *counting* as from *measuring*...that the advantage of mathematical treatment comes." In fact, only through "the conception of continuous quantity" could mathematics become "the direct instrument of the finest generalizations." Thus, he argued, "in the studies of numbers, the idea of continuity is ...indispensable." Through its ability to dissolve differences of quality into differences of degree, the principle of continuity bridged the nominalist disjunction between absolute quantity and actual fact and supplied "a powerful aid to the formation of true and fruitful conceptions."<sup>23</sup>

The mathematical correlate of continuity, Peirce claimed, resided in principles of probability which, as methodological expressions of "continuous quantity," encompassed "the science of logic quantitatively treated." But "there is a real fact," he maintained, "which cor-

responds to the idea of probability, and it is that a given mode of inference sometimes proves successful and sometimes not, and that in a ratio ultimately fixed." Hence probability served to chart the relative frequency with which the passage from doubt to belief produced conclusions in harmony with the "predestinate opinion" which underwrote reality. Peirce described the procedure involved as follows:

There are two conceivable certainties with reference to any hypothesis, the certainty of its truth and the certainty of its falsity. The numbers *one* and *zero* are appropriated, in this calculus, to marking these extremes of knowledge; while fractions having values intermediate between them indicate... the degrees in which the evidence leans toward one or the other.

The object, he claimed, "is, from a given state of facts, to determine the numerical probability of a possible fact." Hence, "the problem of probabilities is simply the general problem of logic" and the meaning of any probability judgment became explicable in terms of a conditional proposition based on "a kind of relative number."<sup>24</sup>

But Peirce had already argued for an essential congruence between meaning and reality in his two previous essays. How, then, could he bring the conditional propositions which expressed meaning in probability judgements into conformity with the "predestinate opinion" which supported that view? Once again, he turned to the principle

of continuity to guarantee the objective validity of his model.

"The idea of probability," he observed, "essentially belongs to a kind of inference which is repeated indefinitely."<sup>15</sup> It thus expressed a quantitative analog of that cumulative inquiry described earlier as "the scientific method of settling opinion." Since the degree of belief in probability judgements varied with evidence drawn from both past and future events, Peirce argued, "in reference to a single case considered in itself, probability can have no meaning." Since the validity of a conditional statement "consists in the truth of [a] hypothetical proposition...and since the only real fact which can correspond to such a proposition is that whenever the antecedent is true the consequent is so also, it follows that there can be no sense in reasoning in an isolated case at all." Indeed, "the very idea of probability and of reasoning rests on the assumption" that the number of inferences drawn will be "indefinitely great." Consequently, Peirce identified "hope in the unlimited continuance of intellectual activity" as an "indispensable requirement of logic" and, predictably, tied that hope to "an interest in an indefinite community." In fact, he concluded, "logicality inexorably requires...a conceived identification of one's interests with those of an unlimited community."<sup>16</sup>

Having settled, at least to his own satisfaction, the question of the validity of probability judgements, Peirce turned next to a discussion of their structure. In "The Probability of Induction," he attempted to go behind Kant's famous question, "How are synthetical judgements *a priori* possible?" to his own antecedent question, "How are any synthetical judgements at all possible?" "How is it," he wondered, "that a man can observe one fact and [probability notwithstanding] straightaway pronounce judgement concerning another fact not involved in the first?" Characteristically, Peirce approached this question through an historical critique, drawing on distinctions between what Venn, in his *Logic of Chance*, had termed the "conceptualist" and the "materialist" views of probability.<sup>27</sup>

"The great difference between the[se] two analyses," Peirce noted, "is that the conceptualists refer probability to an event," thereby isolating it from that flow of "continuous quantity" which underwrote legitimate probability judgements. "Conceptualistic writers," he complained, "do not admit of indeterminate probabilities." This, he warned, led to the misconception "that alternatives of which we know nothing must be considered as equally probable." And this misconception in turn implied "the thoroughly unclear idea of cases equally possible in place of cases equally frequent." But this, Peirce declared, "is only an absurd attempt to reduce synthetic to analytic

reasoning," pointing out that to assume all natural events independent is to assume "that the chances in favor of that of which we are totally ignorant are even."<sup>28</sup> Such an assumption, moreover, encouraged the purely gratuitous conclusion "that Nature is a pure chaos, or chance combination of independent elements, in which reasoning from one fact to another would be impossible." In fact, "it would be to suppose all human cognition illusory and no real knowledge possible."<sup>29</sup> Peirce had definitively rejected such claims in his earlier critique of British nominalism.

Venn's "materialists," on the other hand, accepted probability "as a matter of fact, i.e., as the proportion of times in which an occurrence of one kind is accompanied by an occurrence of another kind." They thus conceived it as "the ratio of frequency of events of a *species* to those of a *genus* over that *species*, thus *giving it two terms instead of one*" (emphasis Peirce's).<sup>30</sup> Peirce's own definition of probability, given earlier in "The Doctrine of Chances", clearly conformed to this materialist view.<sup>31</sup> Moreover, Peirce perceived that by viewing probability as relative frequency, he could maintain its essential time-dependent structure and argue for its ability to generate synthetic inferences in tune with his theory of a continuous reality. Only by defining probability as relative frequency could he claim it as a viable means of investigating that manifold reality he had described.



Peirce made clear his ontological commitment to probability in his analysis of chance. Probability as defined by the "conceptualists," he pointed out, "is the ratio of the favorable cases to all the cases." Chance, on the other hand, expressed "the ratio of favorable to unfavorable cases," and thus related to the process of belief, or habit, formation. The chance of an event, as opposed to its probability, represented the "combination of all arguments in reference to it which exist for us in the given state of our knowledge." It therefore rested ultimately on the antecedent relationship between belief and fact. Moreover, as Peirce pointed out, the isolated events described by the "conceptualists," having a probability of  $1/2$ , all enjoyed "an even chance, or  $1/1$ ." But "an argument having an even chance can do nothing toward reenforcing others, since according to the rule [for the multiplication of probabilities, given earlier], its combination with another would only multiply the chance of the latter by one."<sup>12</sup> Thus the "conceptualists" had no mechanism for analyzing "conjoint probabilities" such as those expressed by the cumulative and interdependent phenomena described by evolution. Chance as reformulated by Peirce, on the other hand, could do just that.

"Chance," Peirce demonstrated, "is a quantity which may have any magnitude."<sup>13</sup> Moreover this quantity, he claimed, "has an intimate connection with the degree of our belief

in it." Since the truth of any given phenomenon depended on its ability to govern the experiential passage from doubt to belief, the objective value of phenomena must vary in direct proportion to the intensity of belief which accompanied them. The mathematical relationship Peirce expressed as follows:

We have seen that the chances of independent concurrent arguments are to be multiplied together to get the chance of their combination, and therefore the quantities which best express the intensities of belief should be such that they are to be *added* when the *chances* are multiplied in order to produce the quantity which corresponds to the combined chance.

"The *logarithm* of a chance," Peirce noted, "is the only quantity which fullfills this condition." Tying this observation to Fechner's psycho-physical theories, which demonstrated that "the intensity of any sensation is proportional to the logarithm of the external force which produces it," Peirce declared his own representation of chance to be "entirely in harmony with this law." "The feeling of belief," he concluded, "should be as the logarithm of the chance, this latter being the expression of the state of facts which produces the belief."<sup>4</sup>

By restructuring probable relations as synthetic inferences and tying them to the process of habit formation, Peirce effectively integrated the logic of probability and the logic of induction. The integration

resulted in a "logic of relatives" to which Peirce had given early expression in his "Logic of Relatives Memoir" which Daniel Merrill has called "one of the most important works in the history of modern logic." In it Peirce replaced the copula "=" with the sign of illation ( ), thereby making inclusion the fundamental logical relation.<sup>35</sup> This substitution, Merrill claims, "was an important step on the road to a less algebraic approach to the logic of classes," a step whose origins, he admits, are "obscure."<sup>36</sup> The present argument would suggest that Peirce's insistence on the relation of inclusion recalls the techniques of topical analysis which had governed Ramean forms. Although the level of analysis proved infinitely more sophisticated in Peirce, the compulsion to subsume relations under classes rather than under other relations characterized both models. Moreover, Peirce tied the logic of relatives directly to the function of symbols, thereby absorbing it into his larger science of semiotic, which also had harmonics in a Ramean paradigm.

Peirce's conviction that the numerical value of chances varied in proportion to the state of our beliefs led him to the consequent belief that the synthetic inferences which governed their calculation must derive from "a classification of facts, not according to their characters, but according to the manner of obtaining them" -- or, as Peirce had phrased it in his second essay, not on "what we think",

but on "how we think." Although "in the case of analytic inference we know the probability of our conclusion," Peirce maintained, "in the case of synthetic inferences we only know the degree of trustworthiness of our proceeding." But "as all knowledge comes from synthetic inference," he noted, "we must equally infer that all human certainty consists merely in our knowing that the processes by which our knowledge has been derived are such as must generally have led to true conclusions." This "rule of induction," in which Peirce located "the whole utility of probability," merely reiterated in logical form "the principle that reality is only the object of the final opinion to which sufficient investigation would lead."<sup>37</sup>

Thus Peirce's analysis of induction, according to which probable statements expressed time-dependent variations of a wider reality, led directly back to his recurrent theme of continuity. The identification of probability and belief accomplished under the doctrine of chances allowed him to claim that the principle of continuity was "simply what generality becomes in the logic of relatives."<sup>38</sup> In his fifth *Illustration*, Peirce would carry his reformulated theories of probability and induction over into the physical sciences and demonstrate their usefulness in investigating "The Order of Nature."

Peirce proposed in his fifth essay "to inquire into the degree of orderliness in the universe" in search of "any

general characteristic, ...any mannerism in the ways of Nature, any law everywhere applicable" which could assist in illustrating the logic of science. To that end, he applied those arguments developed in his earlier essays to a methodological analysis of the concept of order itself. "Any uniformity, or law of Nature," Peirce noted, "may be stated in the form 'Every A is B'." "This is the same as to say, however, that 'there does not exist any A which is not B'; ...so that the uniformity consists in the non-occurrence in Nature of a certain combination of characters. ...Conversely, every case of the non-occurrence of a combination of characters would constitute a uniformity in Nature." But this logical truism, he warned, would only lead the inquirer into an infinite regress unless he took into account the "highly-important logical principle" that "any plurality or lot of objects whatever have some character in common (no matter how insignificant) which is peculiar to them and not shared by anything else."<sup>9</sup>

In support of this "highly important principle," Peirce offered the following proof:

The things, A and B, are each distinguished from all other things by the possession of certain characters which may be named A-ness and B-ness. Corresponding to these positive characters, are the negative characters un-A-ness, which is possessed by everything except A, and un-B-ness, which is possessed by everything except B. These two characters are united in everything except A and B; and this union of the characters of un-A-ness and un-B-ness makes a compound character which may be termed A-B-lessness. This is not possessed by

either A or B, but it is possessed by everything else. This character, like every other, has its corresponding negative un-A-B-lessness, and this last is the character possessed by both A and B, and by nothing else. It is obvious that what has thus been shown true of two things is *mutatis mutandis*, true of any number of things. Q.E.D.

"In any world whatever, then," Peirce concluded, "there must be a character peculiar to each possible group of objects." Hence, "whatever further conclusions we may come to in regard to the order of the universe, thus much may be regarded as solidly established, that the world is not a mere chance-medley."<sup>40</sup>

Peirce's proof established the logical impossibility of complete disorder. Since even an "endless series must have some character," Peirce could claim that "chaos is pure nothing."<sup>41</sup> But in order to construct a corresponding material proof, Peirce had to tie his logical theorem to cognition. "As long as we regard characters abstractly," he pointed out, "the whole system of relationship between the different characters [is] given by mere logic." Fortunately, however, "the explanation of induction by the doctrine of probabilities...is not a mere metaphysical formula, but is one from which all the rules of synthetic reasoning can be deduced systematically and with mathematical cogency." Thus Peirce could maintain that his logic of relatives extended to those material propositions involved in determining the character of physical laws.<sup>42</sup>

"In order to descend from th[e] abstract point of view," Peirce explained, one need only "consider the characters of things as relative to the perceptions and active powers of living beings." To accomplish this, Peirce redefined his theory of induction as "a process of sampling" which "only has its full force when the character concerned has been designated before examining the sample."<sup>43</sup> "When we take all the characters into account," he warned, "any pair of objects resemble one another in just as many particulars as any other pair." But "if we limit ourselves to such characters as have for us any importance, ...then a synthetic conclusion may be drawn...on the condition that the specimens by which we judge have been taken at random from the class." These "statistical inductions," Peirce claimed, involved "the inference that a previously designated character has nearly the same frequency of occurrence in the whole of a class that it has in a sample drawn at random out of that class." They therefore must inevitably lead to "a class of which the same predicate may be affirmed universally," provided only that the investigation prove "sufficiently prolonged." "The truth of this principle," he maintained, "follows immediately from the theorem that there is a character peculiar to every possible group."<sup>44</sup>

Armed with this method of statistical induction, Peirce could argue for the validity of the central assumption of

physical science -- that "there exists a cause for every event, and that of a kind which is capable of being discovered." But "if there be nothing to guide us to th[at] discovery," he cautioned, it "would have no chance of ever getting made." And yet experience demonstrated that "there are certain of our inductions which present an approach to universality so extraordinary that ...we cannot possibly think that they have been reached merely by accident." The concepts of space, time and force, he noted, all presented powerful arguments for the material efficacy of such theoretical forms.<sup>45</sup>

But how, Peirce wondered, could such inferences enter into consciousness at all, much less govern the experiential passage from doubt to belief on which all inference relied. The only logical explanation, he concluded, lay in the assumption that "the mind of man is strongly adapted to the comprehension of the world; at least, so far as this goes, that certain conceptions, highly important for such a comprehension, naturally arise in his mind." In fact, Peirce maintained, the process of determining beliefs which governed the logic of relatives made it clear that "without such a tendency, the mind could never have had any development at all." Moreover, as he hastened to point out, since "the great utility and indispensableness" of these "natural conceptions" suggested that they arose as "the results of natural selection," it followed that they did in fact



relate to the process of habit formation.<sup>46</sup> Consequently, under the terms of his model, Peirce could treat statistical inductions as practical beliefs which led to the formation of adaptive habits, which in turn reenforced beliefs.

Thus evolution, as the process by which organisms absorbed information about their environment and incorporated it into patterns of conduct, expressed an objective version of the theory of probability -- a kind of biological correlate of that progressive increment in knowledge described by the logical process itself. Peirce had argued earlier that the process of natural selection was itself "in large part, a question of logic" which merely applied "the statistical method to biology." Developmental theory, he pointed out, "shows how merely fortuitous variations of individuals together with merely fortuitous mishaps to them would, under the action of heredity, result, not in more irregularity, nor even in statistical constancy, but in continual and indefinite progress toward a better adaptation of means to ends." Since Peirce's cognitive model rendered all human knowledge "the development of our inborn animal instincts," he could further argue that evolution actually governed the incremental process by which reason became incarnate in the world. In a sense, to Peirce, evolution simply presented a special case "of the general adaptation of genetic products to recognizable utilities or ends ...whereby the existent becomes more and

more to embody those generals which [are] said to be destined."<sup>47</sup>

Moreover, having established the objectivity of natural order in a logical proof, Peirce could further extend his metaphors to portray evolution as a process of habit formation that implanted in man's mind certain rudimentary notions, like those of space and time, which accorded with the order of the natural world. But Peirce's "rudimentary notions" bore no resemblance to "innate ideas" of the Cartesian stripe. In fact Peirce's entire critique of Descartes had rested on a rejection of such "metaphysical moonshine." Peirce's notions derived rather from "the constitution of the human mind," being produced "partly by the object, partly by me," and thus avoided any of the subjective implications of Cartesian constructs. Because certain general features prevailed throughout nature, and because the investigating mind itself developed as a product of that nature, these general features became an integral part of the mind through the adaptive process of habit formation. Rather than representing indefensible *a priori* concepts, Peirce's rudimentary notions thus expressed a purely Ramean "affinity between the reasoner's mind and nature's," or, by extension, an "affinity of the human soul to the soul of the universe."<sup>48</sup>

The structural correspondence between logic and experience, previously established in "The Fixation of Belief",

here provided a cognitive justification for those statistical inductions which governed the physical sciences. Furthermore, by making the cumulative processes of evolution continuous with the life of the mind, Peirce brought his principle of continuity to bear on the construction of scientific laws, since to argue for evolution as the ground of induction meant simply to argue for statistical induction as the ground of "that fundamental law upon which all science rolls."<sup>49</sup>

Indeed evolution, taken in conjunction with the logic of relatives, provided Peirce with the objective evidence he sought for his universal principle of continuity. "Natural selection," Peirce claimed, "is a mode of evolution in which the only positive agent of change in the whole passage from moner to man is fortuitous variation." But since "to secure advance in a definite direction chance has to be seconded by some action that shall hinder the propagation of some varieties or stimulate that of others," evolution must be "nothing more nor less than the working out of a definite end" controlled by "a machinery of efficiency" which ensured that, ultimately, "chance begets order." Peirce identified that machinery with his doctrine of chances, which stipulated that plurality implied relativity, which in turn rested on a continuous reality.<sup>50</sup>

"When we gaze upon the multifariousness of nature we are looking straight into the face of a living

spontaneity," Peirce wrote. And yet somehow that primeval spontaneity gave way, through selection, to regularity. Peirce described the process as an extension of statistical generalization and tied it directly to his related theories of meaning and probability:

In the beginning -- infinitely remote -- there was a chaos of unpersonalized feeling, which being without connection or regularity would properly be without existence. This feeling, sporting here and there in pure arbitrariness, would have started the germ of a generalized tendency. Its other sportings would be evanescent, but this would have a growing virtue. Thus, the tendency to habit would be started; and from this, with the other principles of evolution, all the regularities of the universe would be evolved. At any time, however, an element of pure chance survives and will remain until the world becomes an absolutely perfect, rational, and symmetrical system, in which mind is at last crystalized in the infinitely distant future

Thus, evolution "was but the consequence of a theorem in probabilities, namely, the theorem that if very many similar things are subject to very many slight fortuitous variations,...the result must, in the long run, be to produce a change of the average characters of the class."<sup>51</sup>

Peirce's subsumption of the biological under the logical aspects of evolution had important consequences for the construction of scientific laws. According to his statistical account, laws "emerged" from the experiential passage from doubt to belief as transcriptions of the continuous flow of experience. Hence they had the power to accomodate the primal contingency which plagued post-

Darwinian science. "My hypothesis of spontaneity," Peirce claimed, "explains the general fact of irregularity ...[thereby] loosening the bond of necessity." Moreover, "it gives room for the influence of another kind of causation, such as seems to be operative in the mind." The objectively verifiable "coalescence, the becoming continuous, the becoming governed by laws," Peirce maintained, "are but phases of one and the same process of the growth of reasonableness." Chance thus became an active logical principle and the laws which governed its operation became, like all expressions of statistical regularity, continuous reconstructions of events grounded in the antecedent continuity of experience.<sup>52</sup>

Peirce's model thus considered "laws themselves [as] subject to law." But his principles of probable induction stipulated that even the "law of laws must be...capable of developing itself." Since "the only conceivable law of which that is true is an evolutionary law," he reasoned, "we therefore suppose that all law is the result of evolution." Furthermore, "if law is a result of evolution, which is a process lasting through all time," he argued, "it follows that no law is absolute," but must rather relate to those time-dependent structures which comprised the continuous reality expressed by "unlimited community." So "it is clear," Peirce concluded, "that...habit, itself due to the growth by habit of an infinitesimal chance

tendency toward habit-making, is the only bridge that can span the chasm between the chance medley of chaos and the cosmos of order and law." Habit, not inexorable law, expressed the ontological dimension of "the principle of universal continuity... which is involved in all existence."<sup>33</sup>

Under Peirce's model, scientific investigation thus proceeded as a tentative inquiry into the time-dependent structures of habit. Hence it required logical techniques adequate to the task of charting the gradual ascendancy of order over the indeterminate and random events from which habits emerged. Peirce set out to supply those techniques in his sixth *Illustration*, which presented a functional analysis of the methodological roles of "Deduction, Induction and Hypothesis" in the context of his conjoint theories of meaning and truth.

"The chief business of the logician," Peirce began, "is to classify arguments," of which he himself recognized the three types enumerated in his title. Deductive arguments demonstrated "nothing but the application of a rule." Inductive arguments, "being something more than the mere application of a general rule to a particular case," represented a type of "inversion of the deductive syllogism" which inferred "a rule from the observation of a result in a certain case." A similar yet distinct inversion yielded hypothetical arguments, (or as Peirce called

them, abductive inferences), which gave "the inference of a case from a rule and result." "Deduction," Peirce stipulated, "is the only necessary reasoning. ...Induction is the experimental testing of a theory. ...Abduction [or hypothesis] consists in studying facts and devising a theory to explain them." Deduction defined terms; induction evaluated them. But only hypothesis explained anything.<sup>54</sup>

Peirce illustrated his point thus:

Begin with this deduction in *Barbara*:

*Rule* - All the beans in the bag are white.

*Case* - These beans were in the bag.

*Result* - *These beans are white*

Now, infer the rule from the case and result:

*Case* - These beans were in this bag.

*Result* - These beans are white.

*Rule* - All the beans in the bag are white.

This is an induction.

Next, infer the case from the rule and the result:

*Rule* - All the beans from this bag are white

*Result* - These beans are white.

*Case* - These beans are from this bag.

This is an hypothesis.<sup>55</sup>

The problem for experimental science, Peirce observed, lay in a general tendency to confuse the functions of these distinct types of argument. On the one hand, "conceptualist" theories of probability tended to reduce synthetic or inferential forms to analytic or deductive ones. Peirce had dealt with that issue in "The Probability of Induction." But other misguided theorists, although

they might accept a "materialist" view of probability, still tended to confuse the related but distinct roles which hypothesis and induction played in discovery.

Indeed, "the analogy of hypothesis and induction is so strong," Peirce pointed out, "that...hypothesis has been called an induction of characters." But in the first place, he argued, "characters are not susceptible of simple enumeration like objects; [and] in the second place, characters run in categories" and hence could not be treated atomically. Those "mere affair[s] of arithmetic...[which] the physicists call an empirical formula" cannot therefore be likened to hypotheses since they rest "upon mere induction." Although "very useful as means of describing in general terms the results of observations," these inductions could never "take any high rank among scientific discoveries."<sup>56</sup>

Hypotheses, on the other hand, introduced explanatory concepts which "furnish[ed] the reasoner with [a] problematic theory which induction verifies." Peirce summed up the methodological distinction as follows:

Induction is where we generalize from a number of cases of which something is true, and infer that the same thing is true of a whole class. Or, where we find a certain thing to be true of a certain proportion of a class and infer that it is true of the same proportion of the whole class. Hypothesis is where we find some very curious circumstance, which would be explained by the supposition that it was a case of a certain general rule, and thereupon adopt that supposition. Or, where



we find that in certain respects two objects have a strong resemblance, and infer that they resemble one another strongly in other respects.

"The great difference," Peirce argued, "is that [induction] infers the existence of phenomena such as we have observed in cases which are similar, while hypothesis supposes something of a different kind from what we have directly observed, and frequently something which it would be impossible for us to observe directly."<sup>57</sup>

Peirce's methodological distinction had several clear implications for science, not the least of which was to provide a means of dealing with hypothetic inferences like the "imponderables."<sup>58</sup> But its most important consequence in the present context lay in its ability to explain away that confusion of induction and hypothesis which had provided the logical ground and proved the practical undoing of the Baconian and Ramean models expounded by American theorists. The tendency of both Bacon and Ramus to substitute hypothetical or composite forms for inductive inferences had justified the Puritans' organic polity and underwritten the formulation of a national ideology. It had provided an impetus for scientific inquiry and driven the engines of technological advance. But it had also hampered the adaptation of American logical models to the demands of the new science by making it unclear precisely how classification could aid in the construction of

theory.<sup>59</sup> Peirce, by retaining Bacon's emphasis on classification and redefining Ramus' emphasis on structure, clarified the distinct methodological functions of induction and hypothesis and rendered them both genuine ingredients in a defensible logic of science.

Hypotheses, Peirce claimed, are really a means of intellectual ordering -- "a subsumption of a case under a class" which could generate the leading principles by which science progressed.<sup>60</sup> Peirce admitted that "the mind is forced by the very nature of inference itself to make use of [both] induction and hypothesis." Indeed, he claimed, "the best inference, when all possible retrenchment has been made, is the one which being inductive has the most comprehensive subject and which being hypothetic has the most extensive predicate." Such composite inferences supplied "most of the theories of physics." But "hypothesis alone," he claimed, "affords us any knowledge of causes and forces, and enables us to see the *why* of things."<sup>61</sup>

Moreover, the validity of induction, he reminded his readers, derived from its self-corrective method. The validity of hypothesis, on the other hand, derived from its reliance on the antecedent reality of that "predestinate opinion" toward which induction tended. "When we stretch an induction quite beyond the limits of our observation," he explained, "the inference partakes of the nature of hypothesis." And since the principle of continuous reality

stipulated that "there is no line to be drawn beyond which we cannot push our inference," hypotheses thus formed could reach out to those evolving laws which Peirce had established as objective ingredients in nature.<sup>62</sup>

Although the cumulative processes which governed their construction rendered all hypotheses tentative, Peirce maintained that, "they are none the less important for that." In fact, "the great triumph of the hypothesis comes when it explains not only the formulae [of science], but also the deviations from the formulae." "In the current language of the physicists," he noted, "an hypothesis of this importance is called a theory," since a lingering "contempt...clings to the word hypothesis" -- a contempt which he significantly attributed to "Lord Bacon." But unlike Bacon, who had denied hypotheses as valid while smuggling them surreptitiously into his theories, Peirce openly declared that "there is such a thing as hypothetic inference" which was "guided by reasons" derived directly from the cognitive processes he had described in his second *Illustration*.<sup>63</sup>

Significantly Peirce argued that "the utility and value" of his distinction between hypothesis and induction lay in its ability to clarify an "important psychological and physiological difference in the mode of apprehending facts." Unlike induction, he claimed, hypothetic inference involved "a single harmonious disturbance which I call an

emotion." Since "every hypothetic inference involves the formation of such an emotion," Peirce concluded, hypotheses must represent "the *sensuous* element of thought." Induction, by contrast, expressed "the *habitual* element," while deduction, "as the logical formula for paying attention," manifested "the *volitional* element of thought." Like Edwards before him, Peirce thus drew an analogy between hypothesis and emotion which became the ground of a "scientific imagination" which generated discovery. Indeed like all his Ramean forebears, Peirce never lost a compelling sense of the priority of a directly experienced world which led the mind through rational inquiry to an appreciation of its aesthetic forms.<sup>64</sup>

Both the rational and aesthetic power of hypothesis, Peirce maintained, remained unintelligible only as long as men ignored the evolutionary nature of thought. His own cognitive theory, through its emphasis on development, could account for hypotheses as intellectual mutations grounded in instinctive modes of response occurring at the prereflective level of life. Under Peirce's model, hypotheses developed naturally as conjectures arising from the experiential passage from doubt to belief. They expressed rudimentary notions evolved under the impact of environmental forces which coalesced in the mind as explanatory inferences about the world. Moreover, the processive nature of inquiry accounted for the fact that,

out of a multitude of possible constructs, the mind so often struck on fruitful theories. Thus the leading principles which governed science merely reflected cognitive forms of the relatively fixed characters of experience.<sup>65</sup>

But such principles, Peirce pointed out, could only be expressed modally, as "conditional propositions concerning conduct." Since "the basis of Fact is hypothesis," he reasoned, the substance of thought itself must lie "in a conditional resolve." In his later writings, Peirce would extend this maxim to a comprehensive logical program, claiming that pragmatism itself rested on "the principle that every theoretical judgement expressible in a sentence in the indicative mood is a confused form of thought whose only meaning, if it has any, lies in its tendency to enforce a corresponding practical maxim expressible as a conditional sentence having its apodosis in the imperative mood." In fact, he concluded, "conditional propositions, with their hypothetical antecedents," expressed the "ultimate nature of meaning." *But this was precisely the principle upon which Ramean logic had turned!*<sup>66</sup>

Peirce's endorsement of hypothesis brought his argument full circle, tying the logic of science directly to that organic metaboly of signs which had underwritten objective truth in "The Fixation of Belief." Through an analysis of the evolution of logic, the *Illustrations* led Peirce back to an appreciation of the logic of evolution. By drawing

on the cumulative aspects of developmental theory to accomplish a crucial shift in metaphors, Peirce succeeded in outlining a logical model which could accomodate the increasingly time-dependent constructs of theoretical science while still maintaining the characteristic bias of American thought. In fact, he used his methodological critique as a litmus to test the viability of the realist premise in the world of modern science.

In his assessment of the possibility of a logic of science, Peirce clearly came down on the side of his Ramean forebears. Like them, he insisted on logic as the formalized version of a native rationality embedded in the very structures of the mind. Under his revised model, inquiry still described a process by which the mind fitted finite data into appropriate "places" in probable statements which drew their force from "an inseparable connection between rational cognition and rational purpose."<sup>67</sup> This inviolable covenant in turn rested on a continuous reality which, reformulated as "unlimited community," became the logical analog of immortality, underwriting a faith in the mind's ability to make those postulational leaps essential to the construction of theory. The "great principle of continuity" survived as a kind of methodological correlate of judicial review, establishing a probative framework within which to assess those hypothetical imperatives defined by Peirce as laws.<sup>68</sup> And logic

became, once again, the path the pilgrim trod on his journey toward a rational faith in the order and purpose of the world.<sup>60</sup> Indeed, Peirce's *Illustrations*, shaded throughout with the metaphors of the shared and organic elements of human experience, expressed the very essence of the American intellectual tradition -- a tradition with roots sunk deep in a Ramean logical paradigm.

# CHAPTER NOTES

1. The *Illustrations* appeared in Popular Science Monthly between November 1877 and August 1878. They are included in The Collected Papers of Charles Sanders Peirce, ed. Hartshorn and Weiss (Cambridge, 1931-1958) as paragraphs 619-693 of volume II, paragraphs 358-410 of volume V and paragraphs 395-427 of volume VI. (All subsequent references to this collection will be cited as CP, followed by volume and paragraph number.) They appear sequentially in The Writings of C. S. Peirce: A Chronological Edition, ed. Max Fisch (Bloomington, 1982-1986) on pages 242-337 of volume III. (All subsequent references to this edition will be cited as CE, followed by volume and page number.)

2. Fisch calls the *Illustrations* "the 19th Century Discourse on the Method of Rightly Conducting the Reason and Searching for the Truth in the Sciences, and claims that " so far no 20th Century Discourse has superceded it" (CE 3.xxxvii).

3. CE 3.245-246; CE 3.254.

4. CE 3.244-245. See also CP 5.486; CP 2.148.

5. In his later *On the Algebra of Logic*, Peirce reenforced this analogy, claiming that "thinking, as cerebration, is no doubt subject to the general laws of nervous action" (CP 3.155, see also CP 3.157).

6. CE 3.247. Elsewhere Peirce described belief as merely "a habit of which we are conscious" (CP 4.53), "a cerebral habit of the highest kind, which will determine what we will do in fancy as well as what we do in action" (CP 3.160). Logic," he claimed, "takes its reason of existence" from habits "considered as determining an inference" (CP 3.161). "All you can have any dealings with," he warned, "are your doubts and beliefs. ...If your terms 'truth' and 'falsity' are taken in such senses as to be definable in terms of doubt and belief...well and good... But if by truth and falsity you mean something not definable in terms of doubt and belief in any way, then you are talking of entities of whose existence you can know nothing, and which Ockham's razor would clean shave off" (CP 5.416).

7. CE 3.247; CP 1.175.

8. CP 2.713; CP 2.316. In inquiry "something...takes place within the organism which is equivalent to the syllogistic process," Peirce claimed (CP 5.268, see also CP



6.465). In 1883, Peirce even argued for precise physiological analogues of inference (see *A Theory of Probable Inference* CP 2.694-754).

9. CE 3.244; CE 3.253; CE 3.251. The quest for truth, Peirce argued elsewhere, echoing Bacon, unfolded "not as the work of one man's life, but as that of generation after generation, indefinitely" (CP 5.589).

10. CE 3.253-254, CP 5.311. Elsewhere Peirce defined reality as "that which sooner or later information and reasoning would finally result in, and which is therefore independent of the vagaries of me and you (CP 5.311).

11. CE 3.251. Peirce's objections to Cartesian doubt were based on this issue of moral obligation. For Peirce, Michael Weinstein claims, "Cartesian doubt is not only immoral because it is idle, but because it draws practitioners away from the community of inquirers, the task of which is to resolve the real and living doubts that arise in the course of everyday life" (*The Wilderness and the City* (Amherst, 1982), 58).

12. CP 5.354. "With the scientific method," Peirce claimed, "the test...is not an immediate appeal to my feelings or purposes, but, on the contrary, itself involves the application of the method" (CE 3.255).

13. CP 1.491; CP 2.148; CP 5.462.

14. CE 3.xxix.

15. Randall R. Dipert presents an interesting discussion of "Peirce's Theory of the Dimensionality of Physical Space," in which he argues that what distinguished Peirce's theory from those of his contemporaries was precisely its temporal dimension, which allowed him to argue precociously for a non-Euclidean approach to the "space-time continuum" (JHP 16(1978):61-70).

16. CP 2.145, CP 2.650; CP 5.331.

17. Many pages have been written on the genealogy of Peirce's second *Illustration*, most focusing on the illusive "metaphysical Club" to which Peirce himself refers (CP 5.12). For extended discussions see Kuklick, *Rise*, 47-54; Max Fisch, *CE*, 3.xxix-xxxv and "Alexander Bain and the Genealogy of Pragmatism," JHI 15(1954):413-444; Philip P Wiener, "Peirce's Metaphysical Club and the Genesis of Pragmatism," JHI 7(1946):218-233; Daniel D. O'Connor, "Peirce's Debt to F. E. Abbot," JHI 25(1964):543-564. While any of the sources investigated in these discussions might well have been the proximate cause of Peirce's maxim,

however, the present argument would locate its "sufficient reason" in that Ramean tradition which sought to purge logic of its "commentitious" trappings.

18. CE 3.260-261.

19. CE 3.261-262. These elements emerge in Peirce's later semiotic as the "monadic" and "diadic" relations. The third, or "triadic" relation, is treated in the sixth *Illustration* as "abduction".

20. CE 3.262-263.

21. CE 2.265-266. See also CP 575. Feibleman identifies seven different formulations of the pragmatic maxim, of which the one quoted above is the first and most familiar. The remaining six he locates in CP 5.9, CP 5.18, CP 5.467, CP 5.438, CP 6.490, CP 5.412. It is interesting in the present context that Peirce illustrates his maxim with the concept of force. Force in particular, he claims is a "simple affair [which] has muddled men's minds." But under his theory, Peirce claimed, force was no "mysterious entity", since "the idea which the word force excites in our minds has no other function than to affect our actions. ...Consequently, if we know what the effects of force are, we are acquainted with every fact which is implied in saying that a force exists, and there is nothing more to know" (CE 3.270). So much for the "imponderables"!

22. CE 3.271-273, CE 3.275.

23. CE 3.266-268. Elsewhere Peirce argued that, since "future contingency is as real as the present" (CP 6.368), all existence was, in fact, "a matter of degree" (CP 1.175). In some respects, Peirce's arguments for continuity recall Wolff's descriptions of the *complementum possibilitatis*, which supplied the necessary conditions for the reality of individual entities. But where Wolff had stressed the distance between possibility and reality, Peirce bridged the gap with his "unlimited community."

24. CE 3.278-280. Peirce had made an early argument for his theory of mathematical probability in two of the *Lowell Lectures* delivered in 1865 (CE 1.189-204, CE 1.205-222). He reenforced his position in his *Lectures on Pragmatism* (CP 5.21).

25. In 1905, Peirce reformulated this statement mathematically: "When we say that a certain ratio will have a certain value 'in the long run', we refer to the *probability-limit* of an endless succession of fractional values; that is, to the only possible value from 0 to infinity, inclusive, about which the values of the endless

succession will never cease to oscillate; so that, no matter what place in the succession you may choose, there will follow both values above the probability limit and values below it" (CP 2.758). Again in 1910, he affirmed that "it is plain that, if probability be the ratio of the occurrences of the specific event to the occurrences of the generic occasion, it is the ratio that there *would be* in the long run" (CP 2.661). In fact, as Carolyn Eisele points out, Peirce consistently merges the concepts of infinity, continuity and probability ("C. S. Peirce at the Smithsonian," JHI 18(1957):537-547).

26. CE 3.284-285. In later writings, Peirce tied this idea of community back to his formulation of habit, claiming it to be "quite analogous to any *habit* that a man might have" (CP 2.664).

27. CE 3.303-304. "The conception of probability here set forth," Peirce had stated in "The Doctrine of Chances", "is substantially that first developed by Mr. Venn in his *Logic of Chance*. Of course, a vague apprehension of the idea had always existed, but the problem was to make it perfectly clear, and to him belongs the credit of first doing this" (CE 3.281.n). Peirce reviewed Venn's *Logic of Chance* in 1867 (North American Review 105(1867):317-321) and substantially agreed with its representation of probability as "a statistical fact" and "a ratio." In "The Doctrine of Chances," however, Peirce took exception to Venn's referring to the components of probability as "events." "Some of the worst and most persistent errors in the use of the doctrine of chances," he claimed, "have arisen from this vicious mode of expression." Peirce preferred to describe probability as belonging "exclusively to *consequences*," declaring that "the probability of any consequence is the number of times in which antecedent and consequent both occur divided by the number of all the times in which the antecedent occurs" (CE 3.290).

28. "The conceptualist method of treating probabilities," Peirce argued, "really amounts simply to the deductive treatment of them" -- a treatment which led only to "absolutely worthless" inferences carrying "an even chance" (CE 2.304-307). Elsewhere Peirce presented a mathematical proof to refute the assertion that "ignorance is denoted by the probability  $1/2$ " (CP 2.747).

29. CE 3.292, 3.296, 3.298, 3.301.

30. CE 3.291-292.

31. "Probability," Peirce observed elsewhere, "depends solely upon the relative frequency of a specific event...to a generic event" (CP 3.19). Thus it "never properly refers

immediately to a single event, but exclusively to the happening of a given kind of event on any occasion of a given kind" (CP 2.661). Peirce defined probability variously as "the science of the laws of irregularities" (CP 2.769), "a statistical ratio" (CP 5.21) and "a fraction whose numerator is the frequency of a specific kind of event, while its denominator is the frequency of a genus embracing that species" (CP 2.747).

32. CE 3.293-294.

33. See CE 3.292-293, 3.298-303 for the proof.

34. CE 3.293-294. See also CP 2.677.

35. For the "Logic of Relatives Memoir, see CE 2.359-429. See also CP 2.710 and CP 4.5 where Peirce defended his position. For a discussion of the memoir and its importance see Merrill's introductory essay "The 1870 Logic of Relatives Memoir" in Fisch, CE 3.xlii-3.xlviii. See also Feibleman's chapter "The Logic of Relatives" in Introduction, 105-110.

36. CE 2.xlii-2.xliii.

37. CE 3.295, 3.305. Probability statements, Peirce claimed, provided the only form of argument which gained accuracy through repetition (CP 2.729). Hence their validity depended on "a method which, if duly persisted in, must in the very nature of things, lead to a result indefinitely approximating to the truth in the long run" (CP 2.781).

38. CP 5.436.

39. CE 3.307-308.

40. CE 3.308-311.

41. CP 2.784, CP 5.431. See also CP 5.342.

42. CE 3.315-316.

43. CE 3.311. Goudge points out that, in his theory of predesignation, Peirce is "indicating his dissent from the view of scientific procedure which regards it as starting with the dispassionate collection of facts. His emphasis on predesignation," Goudge claims, "is a reminder that facts are always selected because of their relevance to a particular problem at hand" (Thought, 163). Disinterested inquiry, Peirce claimed, occurred only "at the very vanishing point of intelligence." In fact, "the interest which the uniformities of Nature have for an animal measures his

place in the scale of intelligence" (CE 3.312). Peirce defended this position in Lesson 15 of his "Lessons from the History of Scientific Thought".

44. CE 3.316-318. Peirce develops this argument in the context of a critique of Mills' contention that "induction depends for its validity upon the uniformity of Nature" (CE 3.314-316).

45. CE 3.317-318.

46. CE 3.317-318. Elsewhere, Peirce affirmed that logicity itself "is the most useful quality an animal can possess, and might, therefore, result from the action of natural selection" (CP 5.366).

47. CE 3.244; CP 1.395. See Philip Weiner, "The Evolutionism and Pragmaticism of Peirce," JHI 7(1946):321-354.

48. CP 1.7; CP 1.28; CP 1.121; CP 5.47. For Peirce, it always remained " somehow more than a figure of speech to say that nature fecundates the mind of man with ideas, which, when these ideas grow up, will resemble their father, Nature" (CP 5.92). For a fascinating discussion of this aspect of Peirce's thought S. Morris Eames, Pragmatic Naturalism: An Introduction (Carbondale, 1977). Eames treats Peirce's notions as "transactional analyses" of experience. The present argument would attribute them to a predilection for structural correspondences grounded in a persistent Ramean bias.

49. CE 3.319. It is essential to note here that Peirce's view of evolution, as well as his "statistical inductions," were transitional rather than transformative and therefore dynamic and uni-directional. In the *Lowell Lectures*, Peirce had argued that scientific inferences occurred "in one determinate direction, which is not reversed" (CE 1.471 emphasis his). Hence, Peirce's view of incremental inferences could accomodate the concepts of irreversibility explicit in thermodynamics as well as those implicit in evolution. For discussion of some of the scientific implications of Peirce's view see Stephen G. Brush, "Irreversibility and Indeterminism: Fourier to Heisenberg," JHI 37(1976):603-630.

50. CP 6.296, CP 1.205, CP 1.269, CP 6.297.

51. CP 6.553, CP 6.100, CP 6.33, Peirce Ms dated Jan. 24, 1909 entitled "Why should the Doctrine of Chances raise Science to a Higher Plane", p.16 quoted in Weiner, "Peirce's Evolutionism," 335.

52. CP 6.60, CP 5.4. Peirce extended this argument to metaphysics as "tychism." The principle references are found in CP 6.189-209.

53. CP 6.91, CP 6.101, CP 6.262, Peirce Ms L107, p.10 quoted in Fisch, "Peirce and Leibniz," 493. Peirce developed this argument in "The Architecture of Theories", where he attempted to "search out a natural history of laws of nature." "The only possible way of accounting for the laws of nature and for uniformity in general," he argued, "is to suppose them results of evolution" (CP 6.12). For discussions of Peirce's view of natural law relative to Hume see the "Letters to Samuel P. Langley, and 'Hume on Miracles and Laws of Nature,'" in Weiner, Values, 275-321. Peirce significantly identifies the difference between their views as "a different conception of the function of hypothesis and of the logic of hypothesis" (Ibid., 283).

54. CE 3.323-3.235, CP 5.145.

55. Peirce held that the rule of inversion applied to all syllogistic moods and figures (CP 2.512, CP 2.619). On this view, deductive reasoning became the touchstone of logic, a position which caused Peirce some difficulty as his thought developed in the direction of indeterminism in later years. Goudge points out that Peirce was forced to revise this view as his relativistic sympathies matured (Thought, 188-194). In the present context, Peirce's argument for an inverse relationship had important implications for his ontology, since the "A-lessness, B-lessness proof" quoted above supported his entire conception of law.

56. CE 3.330, CE 3.333.

57. CP 2.776, CE 3.332, CE 3.326, CE 3.335.

58. Peirce in fact illustrated his point with the same kinetic theory of gasses described above as being so "troublesome" (CE 3.334-3.335).

59. Deely makes an interesting observation in this regard which has implications for the present argument. "When induction was revised by Bacon," he points out, "it was revised in such a way that the interrelation of certain essential structures of the mind's working were lost from view, i.e., the developmental or historical aspects of the mind's construction of concepts." In fact, all post-Baconian studies, Deely claims, ignored the basic differences between types of logical arguments, until Peirce attempted to clarify the issue. Fisch agrees that Peirce's "major single discovery was that what he at first called hypothesis and later abduction or retrodution, is a distinct kind of argument, different from both deduction and

from induction." But Deely claims that Peirce's theory was merely a rediscovery of Poincaré's theory of *ascensus* and *descensus*, itself a survival of the summulist tradition. The present argument would place the point of origin in a more recent incarnation of the same tradition -- namely that of Colonial Ramists. See John Deely, Introducing Semiotic, 72.

60. CE 1.428, CP 1.470, CP 2.465, CP 2.769.

61. CP 5.145, CE 3.336, CP 5.171-172. It is important to note here the relationship between Peirce's definition of hypothesis as a subsumption under a class and his insistence on inclusion as the fundamental logical relation, discussed above. "Leading principles" defined the classes under which arguments were subsumed, and thereby governed the relationship of inclusion which Peirce deemed fundamental. Hypothesis, by extension became the source of all knowledge (see CP 2.462, 2.465, 2.576, 2.588). The Ramean patrimony is clear. For an interesting contrast on the issue of hypothesis, see James Farr, "The Way of Hypothesis: Locke on Method," JHI 48(1987): 51-72.

62. CE 3.336, CP 2.508-511. Gallie points out that "although Peirce's writings on this issue are distressingly scrappy, there can be no doubt that he did not wish the scope of his pragmatism to be restricted to thoughts, statements, or hypotheses concerning questions of empirical fact. Pragmatism, he maintains, has an important relevance to those parts of our knowledge which are commonly described as purely formal, or apodictic" (Peirce and Pragmatism (Harmondsworth, 1952), 161).

63. CE 3.334.

64. CE 3.336-337; CE 2.229; CE 3.337-3.338; CP 1.46-48. "Peirce relied exclusively upon the claim that the property of feeling is irreducible to a property of matter," Robert Almeder points out ("The Idealism of Charles S. Peirce," JHP 10(1972):484). Conkin agrees. "True belief, in the pragmatic sense," he points out, "involved feeling as well as intellect, volition as well as verbal symbols. The experiential value, the attractiveness of anything, including an idea, resides in the felt quality that accompanies it. Thus the problem for...science is the definition of the quality that gives vitality and life and power to the idea of rationality" (Puritans and Pragmatists, 257). Weinstein concurs that "within the general project of American classical philosophy...Peirce's contribution is the most vitalistic, the closest to a prayer to life. ...He has a direct appreciation of the irreducibility of the 'qualities of feeling', which he gathered under his category of 'firstness' and which kept

him from substituting general ideas for lived experiences (Wilderness, 55).

65. CP 1.316. Weiner points out that "there is in a Peirce a Schellingian tendency to regard the forms of thought as constituting the forms of reality, and that whatever is regulative of thought is bound to be transformative of things or events, for the latter embody feelings or ideas ("Evolutionism...", 347-348).

66. CP 5.535, CE 1.7, CP 5.499, CP 5.18, CP 5.453. Boler places this observation in an interesting perspective by tying Peirce's definition of conditional statements to his definition of causation. Since Peirce argues that a single event cannot be a cause (CP 6.67, CP 6.600) and that meaning derives from an expectation of future actualities (see above), he can subsequently argue that composite relations encompass causality. "If there is any *would-be* at all," Peirce observed, "there is more or less causation, for that is all that I mean by causation" (CP 8.225, n. 10). Boler ties this argument to Peirce distinction of "consequence" and "consequent," a distinction he claims was insufficiently understood by the scholastics. See Boler, Realism, 94-116.

67. CP 5.412.

68. Fisch makes some tantalizing observations which, if pursued, might have important implications for the current argument. More than half of the members of the famed Metaphysical Club, he points out, were lawyers -- among them, Nicholas St. John Green, who Peirce identified as the "grandfather" of pragmatism. Fisch describes "the law-dominated Metaphysical Club" as focusing on seminal "predictive theories" fully "five and a half years before logical pragmatism." Indeed, he questions the common assumption "that Peirce had little or no interest in law, in the philosophy of law, or even in political and social philosophy," noting that his wife Zina's activism inevitably embroiled him in discussions relating to legal theory and that his own family had as strong a background in law as they had in mathematics and science. Indeed, when Peirce was elected a member of the American Academy of Arts and Sciences in 1867, Fisch observes, he was assigned to Class III, Moral and Political Sciences, Section I, Philosophy and Jurisprudence, along with Green and Holmes, rather than to Class I, Mathematical and Physical Sciences, Section I, Mathematics, with Chauncy Wright (CE 3.xxx-xxxv). While Fisch's comments certainly do not constitute evidence that Peirce consciously viewed legal constructs as analogous to logical order as Colonial Ramists clearly had, it does tend to support the link established in Chapter VII between American political forms and Ramean logical meta-



phors. Moreover, it suggests that the realist bias of Peirce's thought served to perpetuate the influence of those Ramean metaphors across the generation of logical, legal and scientific theorists who would build upon his pragmatic maxim.

69. Peirce makes this analogy explicit in "A Neglected Argument for the Reality of God," Hibbert Journal 7(1908):90-112. For a discussion of the implications of the analogy for science see Peter T. Turley, "Peirce's Cosmic 'Sheriff'," JHI 36(1975):717-720.

Chapter 11

**PARADIGM LOST:**

Instrumental Variations

on

A Theme from Peirce

Peirce's unique cosmology drew its force from the fortuitous convergence of a logic grounded in antecedent structure and a science grounded in consequent function. By subsuming the processive theories of modern science under the Ramean bias of his intellectual heritage, Peirce could argue for a rational appreciation of the logic of life which Darwin's evolutionary theories taught. Moreover, he could extend the logical outlines of his argument to embrace the cosmic dimensions of an evolution conceived as the progressive realization of rational purpose in the world. In short, he could reestablish inquiry as an endeavor in which the vocations of Saint and scientist merged.

Peirce labelled his cosmological synthesis *agapism* and defined it as a pervasive doctrine of continuity. In agapistic evolution, Peirce maintained, the functional processes of nature conformed to an overarching purpose radiating from a cosmic rationality essentially indivisible

into discrete thoughts or isolated personalities. By virtue of their participation in this cosmic whole, individual entities or events possessed no absolute finitude, but existed rather as stages in an ongoing process of reconciliation whereby the final goals of thought became the ruling habits of things. Inquiry, in turn, came to embrace the total intellectual life of humanity and was identified with the logical process itself, while reality became an ideal state of complete information -- essentially knowable, but never fully known.

The ontological correlate of Peirce's model rested on his categories of Firstness, Secondness and Thirdness -- modes of being which in their integral relations expressed the continuous structure of reality. Firstness, the mode of pure potential, entailed "positive qualitative possibility;" Secondness, the mode of existence, comprised "the being of actual fact;" and Thirdness, the mode of generality, encompassed "the laws which will govern facts in the future."<sup>1</sup> Inquiry, Peirce argued, in fact charted a logical passage from Firstness to Thirdness -- and an analogous ascent from the lawlessness of prereflective events to the perfect rationality of habit.

Firstness, Peirce tells us, affected consciousness as "an actual passage at arms between the ego and the non-ego," but had no intellectual value. It entailed no mental occurrence, only a physical event which brutally forced

itself upon the mind. Firstness, Peirce explained, "is the reality. It is not in propositional form." Hence it had no psychological status. Mental construction, he argued, entered consciousness only at the level of Secondness, where the mind formed perceptual judgements which gave "the intellect's description of the evidence of the senses." Secondness comprised the world of fact with which reason dealt, thereby providing the cognitive ground for Thirdness, the methodological analog of the principle of continuity. Thirdness -- or generality, or habit, or law -- thus formed an ineluctable part of the cosmos which "poured in on us through every avenue of sense."<sup>2</sup> Without it, Peirce claimed, inquiry at any level must fail.

Peirce's entire cosmology depended on the ontological status of Thirdness. Without it as a regulative principle, his pragmatic theory of meaning, along with his realist reconstruction of science, simply could not stand against the reductionism explicit in nominalist and positivist logic.<sup>3</sup> But ultimately, it was the inter-relatedness of Peirce's three categories which provided the strongest support for his cosmology. His assumption that a syn-categorematic relation pertained between the organic functions of Firstness and the higher symbolic functions of Thirdness served to break down the rigid dualism between organism and environment on which both sensationalist psychology and nominalist science had turned. Under

Peirce's model, the organism joined with its environment in a transactional process governed by the relational matrix of the categories. Laws unfolded as the product of a method whereby the mind explored a shared reality. And truth took on the aspect of a collective wisdom expressed through conduct.

But Peirce's methodological synthesis could not stand against the centrifugal forces at work in American intellectual life as the 19th century drew to a close. As the nation struggled to recover from the trauma of civil war and reconstruction, rapid changes in its economic and demographic base wrought an inversion and confusion of values. The absorption of vast numbers of immigrants from increasingly disparate cultural backgrounds and the social dislocations which came in the wake of progressive urbanization tended to disrupt traditional ideologies. While the Metaphysical Club met in Boston, the Tammany Club met in New York. While Emerson preached self-reliance in Cambridge, enterprising citizens defrauded the Home of Independence and Brotherly Love in Philadelphia. The Chicago Fire destroyed a thriving urban center, while territorial expansion destroyed a vast natural wilderness. As the national government struggled to adapt a federal political system to an increasingly centralized economy, American labor stumbled through the Homestead and Pullman strikes. And as widespread corruption tainted leadership

at the local and national levels, Robber Barons precipitated an actual and metaphoric restructuring of values in the gold crisis and the Erie War.

1887 ushered in disastrous drought and the Interstate Commerce Act. 1888 brought devastating blizzards and a new interpretation of the 14th Amendment. 1890 marked the passage of landmark anti-trust legislation, yet 1892 still saw bloodshed at Haymarket Square and the formulation of a powerful Populist platform which described a nation "brought to the verge of moral, political and material ruin."<sup>4</sup> 1893 brought panic.

As all these tangible influences worked profound changes in the fabric of American society, so the attempts to construct a philosophic rationale for them signalled an equally profound adjustment in the nation's intellectual life.<sup>5</sup> The collapse of the Social Darwinian dream and the disintegration of Unitarian ethics caused a noisy battle to be joined between transcendental visionaries and utilitarian die-hards who brought forth a flood of patent remedies for the philosophic malaise which plagued the nation. But this embarrassment of speculative riches itself inspired confusion and stimulated doubt. Commager claims that in fact it served to "atomize" America's philosophic response. "The political readjustment of the Revolutionary era," he explains, "had been prepared for by generations of thought and training and a decade of high-

minded discussion. ...[But] there was no comparable philosophical preparation for the effort to come to terms with the new world of science and technology that loomed up over the horizon in the closing years of the 19th century."<sup>6</sup> And indeed, the single thread which seemed to run through the nation's eclectic intellectual life at the turn of the century appears in what Morton White has called a consistent "revolt against formalism" -- a revolt against precisely that synoptic impulse which had underwritten all inquiry for Peirce.<sup>7</sup>

But the fate of American philosophy after 1890 can also be characterized as a loss of continuity -- an analytical fragmentation of that continuous reality which Peirce had so laboriously constructed through his categories. Indeed James, Dewey and Royce -- the three philosophers who owed the most to Peirce's pragmatic insights -- each seemed intent on breaking off a piece of Peirce's organic whole and elevating it to the status of an ultimate truth. James sinned against Firstness by confining the possibilities of experience within the ambit of an individual mind; Dewey betrayed Secondness by limiting human aspiration to the social order; and Royce transgressed against Thirdness by transforming the relational matrix of the categories into an ideal consciousness. Each, in his own characteristic variation on Peirce's theme of continuity, lost sight of the essential inter-relatedness of Peirce's categories and

so lost touch with that continuous reality which they underwrote.

William James was the worst offender -- if only by virtue of his uncanny ability to mask his defection in a vivid popular style which made it all the more palatable to minds seeking respite from the rigors of formal analysis. James departed radically from Peirce's model in the elaboration of his own pragmatism in the 1890's. Although only three years younger than Peirce, James lagged far behind him in philosophical development. The 1860's, which found Peirce already immersed on his systematic critique of Kant, Mill and Descartes, found James still "swamped in empirical philosophy."<sup>8</sup> In fact not until well into the 1880's, after Peirce had already drawn out the logical implications of his *Illustrations*, did James "outgrow" his attachment to empiricism and begin to elaborate his own philosophical system -- for which he drew heavily on principles enunciated by Peirce.

But, as Ralph Barton Perry has observed, James played havoc with many of Peirce's central assumptions. Indeed, "perhaps it would be correct, and just to all parties," he claims, "to say that the modern movement known as pragmatism is largely the result of James' misunderstanding of Peirce."<sup>9</sup> James Feibleman goes somewhat farther, claiming that "not even by the utmost exertion of tolerance and sympathy can James' philosophy be said to be an extension



or development of Peirce's, although no doubt certain aspects of it...were suggested to James by Peirce."<sup>10</sup> Peirce himself, in later years, did what he could to distance himself from James' formulation of pragmatism, his clearest rejection of it appearing in the famous essay "What Pragmatism Is."<sup>11</sup> Peirce had intended his pragmatic maxim as a theory of meaning -- that is, as a methodological guide to the logical process itself. "Professor James," Peirce complained in 1908, "remodelled the matter and transmogrified it into a doctrine of philosophy, some parts of which I highly approved, while other and more prominent parts I regarded, and still regard, as opposed to sound logic."<sup>12</sup>

Ironically, Peirce himself had invited James' misconstruction by insisting as early as 1868 that "every sort of modification of consciousness...is an inference" and explicitly establishing a "striking analogy" between emotion and hypothesis.<sup>13</sup> Indeed, "The Doctrine of Chances" had identified three "sentiments" as the "indispensable requirements of logic." But Peirce's perception of the "emotive" or "sensitive" aspects of logic had related directly to his aesthetic vision of a continuous reality. "When we consider," he pointed out, "that logic depends on a mere struggle to escape doubt, which, as it terminates in action, must begin in emotion, and that, furthermore, the only cause of our planting ourselves on reason is that

other methods of escaping doubt fail on account of the social impulse, why should we wonder to find social sentiment presupposed in reasoning?"<sup>14</sup> James, on the other hand, took Peirce's argument from "social sentiment," stripped it of all its logical attributes, and arrived at a cognitive theory which pursued pragmatic meaning among the purely psychological effects of sense experience.

Peirce had explicitly dismissed psychology as irrelevant to the process of determining meaning. In an argument which would have served his Puritan ancestors well in their continuing battle against "enthusiasm," he pointed out that psychology could not supply self-validating predicates and therefore could not serve as a means to investigate truth. Peirce, in fact, doubted that there was "any such thing as psychology, apart from logic on the one hand and physiology on the other." Therefore, he invited investigators to "adopt any theory that seems to you acceptable as to the psychological operations by which perceptual judgements are formed." What mattered was the inferential process itself, conceived as a function of the formal properties of thought. At the heart of inference, Peirce argued, lay habit -- "the essence of the logical interpretant" -- and habit "is not an affectation of consciousness." Perceptual judgements themselves thus occurred entirely outside the realm of psychology in that region defined and controlled by habit.<sup>15</sup>

James, on the other hand, translated Peirce's logical maxim into the language of associationist psychology, replacing "conceiveable" with "sensible" effects as the controlling factors in inquiry. Where for Peirce (as for Ramus), judgement had provided a method for fixing meaning at the level of argument, for James it became a method for determining truth at the level of experience. Under James' analysis, judgement became a mere matter of "pointing" -- a process which, in the tradition of Locke and Hume, "must terminate in the world of orderly sensible experience."<sup>16</sup> "What science means by 'verification'," James explained, "is no more than this, that no object of conception shall be believed which sooner or later has not some permanent and vivid object of sensation for its term. ...Conceived objects must show sensible effects or else be disbelieved."<sup>17</sup> Truth, he maintained, denoted the satisfactory accomodation of one sense datum with another, not the agreement of perceptual judgements with an antecedent order. In direct opposition to Peirce's analysis of probability, James declared truth "an event" which stood in relation, not to a continuous or shared reality, but rather to the history of an individual mind.<sup>18</sup>

James stubbornly refused to submit his psychological conception of truth to critical analysis, dismissing Kant's famous distinction between analytic and synthetic forms as "one of his most unhappy legacies" where Peirce had found

it one of his most fruitful. The words "analytic" and "synthetic" did not label intrinsic qualities of experience for James or even cognitive modes. They simply portrayed ways in which the mind classified experience. The classification depended upon purpose, and the purpose depended on the will. "The analytic-synthetic debate," James claimed, "is thus for us devoid of all significance." In fact, in an ironic inversion of the Baconian ideal, James declared the differentiation of these forms an "idol of the tribe" and banished them from inquiry!<sup>19</sup>

James arrived ultimately at the conviction that synthetic and analytic processes were not only dynamically continuous, but functionally indistinguishable. "Life, ...concreteness, immediacy, use what word you will," he claimed, encompassed both analysis and synthesis inextricably fused in a flow of experience which "exceeds our logic, overflows and surrounds it." Experience so construed remained impervious to formal inquiry. "For my own part," James admitted, "I have finally found myself compelled to give up the logic, fairly, squarely, and irrevocably."<sup>20</sup> Logic, he maintained "stands to the psychological relation...only as saltatory abstractness stands to ambulatory concreteness. Both relations need a psychological vehicle; and the 'logical' one is simply the 'psychological' one disemboweled of its fullness and reduced to a bare abstractional scheme." For Peirce, logic

had been constitutive of a continuous reality. For James it became merely "a transformation which the flux of life undergoes at our hands in the interest of theory."<sup>11</sup>

Peirce deplored James' lack of logical rigor and his inclination to confound psychology with logic. In his review of the *Principles of Psychology*, he attacked James' disregard for analytic/synthetic distinctions and charged him with an "uncritical acceptance of data...[which] practically amounts to a claim to a new kind of liberty of thought." "The notion that the natural sciences accept their data *uncritically* we hold to be a serious mistake," Peirce objected. On the contrary, he pointed out, the first thing a physicist does is to subject his data "to rigid criticism to find whether these phenomena are objective or subjective." Moreover, by refusing to give "any exhaustive scrutiny of his new logic in its generality," Peirce warned, James displayed "an originality of the destructive kind."<sup>12</sup>

In general, Peirce found James' *Principles* to be "a large assortment of somewhat heterogeneous articles loosely tied up in one bag, with tendencies toward sprawling" -- an ironic assessment considering the source! James, he claimed, seemed prone to "subject to severe investigation any doctrine whatever which smells of intelligibility" and to rely rather on "the general incomprehensibility of things" as an explanatory principle. The book, he argued,

"should have been preceded by an introduction discussing the strange positions in logic upon which all its arguments turn" -- the most alarming of which to Peirce was its proposal to "banish from psychology" those ideas which comprised "the direct data of consciousness." Not only does James propose, "by the simple expedient of declaring certain inquiries extra-psychological, to reverse the conclusions of the science on many important points," Peirce complained, "but also by the same negative means to decide upon the character of its data" in order to validate his method.<sup>23</sup>

The argument between James and Peirce turned on their respective definitions of perception. Peirce, like a good Ramean, had characterized perception as the logical operation of judgement -- that is, as a mediate stage of inference between the "firstness" of pure sensation and the "thirdness" of habit. James, on the other hand, vigorously denied that perception required any "additional wheelwork of the mind." "To call perception unconscious reasoning," he argued, "is either a useless metaphor or a positively misleading confusion between two different things." "So far," he maintained, "from perception being a species of reasoning, properly so called, both it and reasoning are coordinate varieties of that deeper sort of process known psychologically as the association of ideas, and physiologically as the law of habit in the brain."<sup>24</sup>

Peirce, predictably, protested and accused James of "forgetting his logic" or, what was even worse, attempting to subsume it under psychological categories. All perception, Peirce argued, "involves a conscious, though it may be an indistinct, reference to a genus of arguments." "To explain any process not understood," he maintained, "is simply to show that it is a special case of a wider description of process which is more intelligible." Perception thus "attains a virtual judgement. ...It subsumes something under a class, and not only so, but virtually attaches to the proposition the seal of assent."<sup>25</sup>

James, he objected, ignored the logical structure of composite statements (pace Ramus!), pointing out that "we might suppose he had never heard of the *modus ponens*."<sup>26</sup> Rather he depended on "some ultra-Leibnizian *unconscious* perception" to supply his middle terms.<sup>27</sup> James, along with other associationists, Peirce claimed, assumed that "the proposition 'If A then B' is represented by the association itself, which is not present to consciousness." But this telescoped the triadic process of reasoning into an overly simplified diadic association -- in short, into James' process of "pointing".<sup>28</sup> On the contrary, Peirce maintained, since "unconscious inference does not...mean an inference in which any proposition or term of the argument is unconscious," but rather simply an "inference in which the reasoner is not conscious of making an inference," per-

ception did in fact entail a type of synthesis which occurred, not at the level of psychology, but rather at that formal level defined and controlled by logic.<sup>29</sup>

James always maintained a sort of surreptitious methodological dualism which allowed him to accept, for the purposes of psychology, the existence of certain intrinsically psychical or mental realities. He never quite escaped the legacy of Descartes and Locke. Although the distinction between thought and thing originated for him within experience as a function of perception, the distinction still pertained. Peirce, on the other hand, could portray matter as "mind hide-bound with habits," since his description of cognition rested on the inter-dependent physiological states of doubt and resolution rather than on some external relation between the mind and consciousness. By dismissing, or perhaps just not comprehending, the logical content of Peirce's argument, James effectively transformed his organically grounded perceptual judgements into vehicles of causal rather than analytical consequence. Where Peirce had made ideas clear by considering their logical content and their general or habitual purport, James made them clear by considering their psychological and behavioral effects, giving them an actual causal status.<sup>30</sup>

Although James, like Peirce, accepted pure experience as the irreducible ground of cognition, his associationist



bias led him to view perception as a process of selective abstraction which occurred *within* experience, rather than as an integral part of a manifold logical process. Hence, for James, Peirce's prereflective percepts and his mediate judgements (the *materia* of Firstness and Secondness) both collapsed into a pervasive "ontological emotion" which became the existential cement binding the mind to its objects. Thirdness disappeared completely. Where for Peirce belief had comprised "the demi-cadence which closes a musical phrase in the symphony of our intellectual life," for James it became a "craving of the heart" which issued, not in the rational assent of a perceptual judgement, but in an emotional consent to feelings. This consent manifested itself through the will, which projected "our inveterate propensity to choice" onto the world.<sup>31</sup>

"The will," James claimed, "mentally considered, is consent to a fact of any kind." Indeed, belief and will not only controlled "inseparable functions," they actually denoted two names for the same psychological phenomenon of subjective preference.<sup>32</sup> By contrast, the associationists had identified the will with a nervous discharge correlated to a physical "feeling of effort." But this "feeling of effort" represented an externalization of the will which James, drawing on Edwardsean metaphors, could not accept. For James, the will projected an inward flowing sensation which actually helped to shape its physical counterpart.

Indeed, the feelings or actions precipitated by the will became irrelevant to the analysis of the intent itself, which lay ultimately in the realm of psychology. But this "redirection" of the will, which allowed James to equate its operation with belief, carried him a considerable distance from Peirce's original pragmatic insight.

"In every proposition," James argued, stepping definitively outside Peirce's logical construct, "four elements are to be distinguished, the subject, the predicate, and their relation (of whatever sort it be), and finally the psychic attitude in which our mind stands toward the proposition taken as a whole." By introducing "psychic attitude" as a fourth element in cognition, James effectively vitiated the constitutive force of Peirce's logical categories and gave the will, as the vehicle of "selective interest," a controlling role in inquiry. "Without selective interest," James claimed, "experience is an utter chaos."<sup>33</sup>

James' version of selective interest, however, bore little or no resemblance to the "predesignation" described by Peirce in his defense of statistical inductions. Indeed Peirce, like James, denied the efficacy or even the possibility of totally disinterested inquiry. But for Peirce, the "predesignation of characters" had controlled a logical "process of sampling" which determined the relative frequency of terms within a class.<sup>34</sup> For James, on the other

hand, selective interest actually conferred reality upon individual sensation. It manifested the propensity of the will to direct the mind in the gratification of private interests. Thus, in a sense, James lifted Peirce's "predesignated characters" from within a manifold logical process and relocated them in the stream of consciousness of an individual mind.

James insisted that "the concept of 'being' or 'fact' is not wider than or prior to the concept of 'content of experience'," thereby tying all cognition to primary data and confining it within the boundaries of Firstness.<sup>35</sup> This in turn ensured that the individual will would control the results of inquiry. The will, James claimed, "determine[s] what we notice; what we notice determines what we do; and what we do determines what we experience." Hence reality became "largely a matter of our own creation." Since "our own reality...is the ultimate of ultimates for our belief," James concluded, "the world of living realities...[must be] anchored in the Ego, considered as an active and emotional term." No unlimited community, but rather "the absolute, uncriticised reality of the Self is the root of the whole matter."<sup>36</sup>

James here approached a Nietzschean concept of the Absolute Individual. Only his scientific training -- and perhaps a bit of his own "unconquerable subjectivity" -- caused him to temper his psychological model with a

philosophy of radical empiricism rather than developing it into a full-blown existentialism.<sup>37</sup> And yet, by insisting on the primacy of the person in his psychology and turning the dynamics of analysis inward through his reliance on the will, James clearly moved beyond the logical position of Peirce into a purely philosophical stance curiously reminiscent of Edwards.<sup>38</sup> James' radical empiricism aspired to be more than a theory of inquiry. It aimed rather at an actual metaphysics of experience -- one which would solve the problem of cognition by collapsing Peirce's categories into a "neutral monism" generated by the conative rather than the cognitive dimensions of thought.

James' radical empiricism, however, had the great disadvantage of leaving moral issues definitively aside.<sup>39</sup> His refusal to clarify, or even to acknowledge, a distinction between analytic and synthetic propositions led to a consequent lack of clarity on the nature of moral judgment. This was precisely the problem which had plagued the Cartesians, who had solved it through their "provisional morality." But although James at all points appears to *assume* a moral dimension in the same way that Descartes acquiesced to his authoritative ideal, he interpreted that dimension, not as a commitment to community mediated by an idea, as for Peirce, but rather as an effort at sympathy in which individual experience encouraged human solidarity. James believed in a moral universe. But he had nothing to

offer others except that they might participate in his own acquiescence.<sup>40</sup> "Morality," he declared, "is simply a matter of will. The moral idea, once selected, is sustained by a resolute effort of attention and 'ere long succeeds in calling up its own congeners and associates, and ends by changing [a] man's consciousness altogether. And with his consciousness his action. ...The free will controversy is thus extremely simple," he concluded. "It relates solely to the amount of effort of attention which we can at any time put forth."<sup>41</sup>

For Peirce plurality had implied relativity and relativity had implied community, supplying a logical ground for moral action. "Individualism and falsity," Peirce declared, "are one and the same." He had therefore worked tirelessly to "grind off the arbitrary and individualistic character of thought" through an investigation of its formal structures.<sup>42</sup> But for James plurality implied variety and variety implied individuality, moving him much closer to existentialism than Peirce ever got.<sup>43</sup> The risk for James personally lay in having to contend with a kind of Pascalian angst grounded in a realization of his own finitude. This sensation of cosmic isolation drove him to his famous encounter with "panic fear" which led him ultimately to develop his views on radical contingency as consolation. "Radical empiricism," James himself pointed out, "leads to the assumption of a collectivism of *personal*

lives, ...variously cognitive of each other, variously con-  
 ative and impulsive, genuinely evolving and changing by  
 effort and trial, and by their interaction and cumulative  
 achievements making up the world."<sup>44</sup>

James' opaque pragmatic morality thus grew directly out  
 of what Peirce perceived as his lack of logical rigor. For  
 Peirce, pragmatism always remained the "logic of  
 hypothesis" expressed through modal forms and grounded in  
 the integration of means and ends. But the intimate con-  
 nection between moral and rational behavior for which  
 Peirce had argued rested, as it had for Ramus, on the cen-  
 trality of hypotheticals in inquiry -- on the "ought" rela-  
 tion expressed by composite constructions. James, on the  
 other hand, had collapsed Peirce's composite relations into  
 diadic associations, thereby transforming his "if...then"  
 statements into far less stringent "either...or" statements  
 in order to allow for the operation of his uncriticized  
 Self. He thereby destroyed the intrinsic Peircean/Ramean  
 connection between logic as rational inquiry and law as a  
 moral imperative. James' "either...or" relations, although  
 descriptive of atomic experience and prescriptive of per-  
 sonal conduct, remained essentially non-referential and  
 thus had no apodictic force. While this allowed James to  
 ignore the theory of practice which had been so central to  
 Peirce and to conceive of axiology rather as the study of  
 preferential behavior, it also led him by consequence to

adopt an instrumental theory of value which lacked the aesthetic qualities of Peirce's theoretical vision.

In a sense, James' retreat from hypotheticals amounted to an acceptance of the principle of *eupraxia* and a rejection of the supporting *ars technologicae*. His commitment to the individual and to the maxim that "thought consists in acts" made practice, not truth, the sole aim of inquiry. Peirce, on the other hand, had argued that thought was intended to "apply to...conceived action" and claimed that in his own pragmatic maxim he had been "speaking in no other sense than that of *intellectual purport*."<sup>45</sup> Pragmatism, he warned, "is correct doctrine only in so far as it is recognized that material action is the mere husk of ideas. ...The end of thought is action only in so far as the end of action is another thought." Thus the goal of inquiry is not practice but "conditional general resolutions to act...[which] by modifying the rules of self-control modif[y] action, and so experience too."<sup>46</sup> Peirce had relied on the force of these "conditional general resolutions" to underwrite his moral vision of "social sentiment" and an unlimited community. But where Peirce's maxim called for selfless commitment to a continuous reality, James' called for "free enterprise in the moral realm" and a license to enjoy post-rationalized "moral holidays" into the bargain.<sup>47</sup>

Pragmatism ultimately became the logic of self-control for Peirce. Under his model, the very conditions of scientific inquiry had a presumed ethical bias. The generation of logical laws or habits necessarily entailed moral considerations since logic itself required the application of self-control in intellectual operations. But this in turn required some rule against which to measure method. The logically good, Peirce concluded, must simply represent a particular species of the morally good. Peirce, in fact, came increasingly to substitute the ethical term "control" for the biological term "habit" in his writings, arriving at length at the conclusion that the real test of any hypothesis lay "in its value in the self-controlled growth of man's conduct of life."<sup>48</sup> Through ethics -- "the study of what ends of action we are deliberately prepared to adopt" -- logic could construct "a sort of composite photograph of the conscience of the members of the community." Self-control thus became a virtual prerequisite for citizenship in the world of rational endeavor.<sup>49</sup>

But Peirce's ethical ideal could not survive James' voluntaristic assault. Pragmatism emerged from its encounter with radical empiricism chastened and sobered, having lost confidence in its own ability to function as a normative science. It was in this diminished state that John Dewey found it when he embarked on his own project of reconstruction near the turn of the Century. Concerned



that the voluntaristic emphasis of James' psychology obscured the ethical dimensions of pragmatism, Dewey undertook to restore Peirce's ideal of community, if only for the limited purposes of social reform.

"The problem of restoring integration and cooperation between man's belief about the world in which he lives and his beliefs about the values and purposes that should direct his conduct," Dewey declared, "is the deepest problem of modern life."<sup>50</sup> He agreed with James that without an experiential reference, no concept, however self-consistent, could have any existential import. But experience, he argued, "is not a verb that shuts man off from nature; it is a means of penetrating continually further into the heart of nature."<sup>51</sup> Hence the place to search for those integrative factors which gave purpose and meaning to life must be within the processive functions of experience itself -- that is, within that sphere of interaction between primary sensation and the mind which Peirce had termed Secondness. Dewey's entire philosophical program can in fact be seen as an attempt to reintegrate James' "absolute, uncriticized Self" into a moral program reconceived as natural science -- all under the category of Secondness made comprehensive and renamed simply Nature.

In an effort to avoid James' existential dilemma, Dewey offered a physiological, rather than a psychological, analysis of judgement. By establishing physiology as the

matrix within which cognition occurred, Dewey could argue for an empirical account of logic which subsumed all inquiry, including its formal properties, under the rubrics of adaptive behavior. "All logical forms," Dewey declared, "*originate* in operations of inquiry."<sup>32</sup> So construed, logic became a function of life and judgement a shorthand transcription of the flow of experience which allowed for the management of conduct. These transcriptions indeed contributed to the construction of "habit systems". But they enjoyed no ontological status, serving merely to define the "actual operative presence of connections in the subject-matter of direct experience."<sup>33</sup>

Peirce had considered inferential judgements constitutive of a shared reality. James had affirmed their creative role but had confined their operation to the constitution of a private world. Dewey took a middle course, arguing that although inferential forms grew out of interactive encounters with the environment, they were not necessarily reducible to the conditions of individual response. "Experience," he pointed out, "reaches down into nature; it has depth. It also has breadth and to an indefinitely elastic extent. It stretches. That stretch," he argued, "constitutes inference."<sup>34</sup>

Through this radical reduction of ontology to epistemology, Dewey placed conscious activity in control of logic, effectively subsuming it under Peirce's category of

Secondness.<sup>55</sup> It was the *process* of drawing inferences, Dewey argued, which conferred meaning on experience, not reference to an atomic mind or an extant reality -- that is, reference back to Firstness or forward to Thirdness. Indeed Dewey obviated the need for either Firstness or Thirdness by portraying the "irritation of doubt" and its resolution as conscious reactions to problematic situations. Inquiry, he claimed, "is the controlled or directed transformation of an indeterminate situation into one that is so determinate in its constituent distinction and relations as to convert the elements of the original situation into a unified whole."<sup>56</sup> Thus judgement became, not rational assent as for Peirce, nor voluntary consent as for James, but rather "an act" which projected purpose onto the world.

This proved a far cry from Peirce's "sensation" of doubting or James' "sentiment" of belief. Under Dewey's model knowledge in fact became "a product, mediated through certain organic mechanisms of retention and habit [which] presupposed prior experiences and mediated conclusions drawn from them." But this amounted in turn to a complete objectification of Peirce's category of Thirdness. The object of knowledge, Dewey claimed, is merely a situation refashioned by conscious activity in order to solve a problem. The validity of an idea thus had nothing to do with its conformity to an external reality. Ideas had value

only as they proved capable of reconstructing the world.<sup>57</sup> Through inference, Dewey claimed, the mind gave apposite form to an extrinsic environment by "stretching" experience into instrumental configurations which in turn controlled conduct. Thus all general propositions proved "strictly normative in character, having as their sole excuse for being, and their sole test of worth, their capacity to regulate descriptions of individual cases...[and] operate instrumentally in first-hand dealings with reality."<sup>58</sup>

Peirce objected strongly to Dewey's position, claiming it tantamount to a reduction of logic to "a natural history of thought." Although the formal properties of thought might develop within the context of experience, Peirce argued, they were in fact antecedent to it and evolved only according to an independent law itself evolving -- a principle which he claimed was "stripped by Dewey of all rational precision." Dewey, Peirce complained, confused proximate human purposes with the final goals of inquiry and so reduced analysis to problem solving. Thus, where Dewey claimed to have established a "science of intelligence," Peirce denied that he had even described an intelligent science.<sup>59</sup>

But Dewey's instrumental logic did have the signal advantage of maintaining an extrinsic reference for logical forms -- something which James' radical empiricism could not do. By making inferential judgement over into a con-

scious activity, Dewey removed it from James' psychological world and relocated it in public space, thus giving it an ethical dimension. "A continuous way of organized action," he protested against James, "is not a particular."

Although the formal properties of thought might originate in individual reactions to stimuli, those reactions themselves involved the projection of goals which in turn conditioned future response, thereby supplying a ground for moral action.<sup>60</sup> Dewey articulated his position in his famous "reflex-arc" theory which, in a sense, threw a curve at psycho-physical parallelism. "So far as...judgement is identified as an act," he claimed, "all a *a priori* reason disappears for drawing a line between the logic...of the recognized sciences and that of conduct."<sup>61</sup> Thus James' existential insecurity became a matter for depth psychology and logic reentered the community as an instrument of social purpose.

Ironically, it did so under the auspices of Peirce's own principle of continuity. "There is a continuity of inquiry," Dewey declared, "[in which] the conclusions reached in one inquiry become means, material and procedural, of carrying on further inquiries."<sup>62</sup> Hence, the logical process possessed an intrinsic social dimension. Moreover, since the ends of inquiry conditioned its means, instrumental values could in fact emerge from within the data of primary experience through the application of

reason. Unlike Peirce, however, Dewey argued that although the logical process resembled that of "entering into a contract [in that] it commits the enquirer to the observance of certain conditions," those conditions did not extend to the stipulation of ends, which rather issued from the process itself.<sup>41</sup> Hence, where James had relocated Peirce's logical process in the individual stream of consciousness, Dewey relocated it in social interaction.

Dewey's characteristic definition of judgement as "an act" effectively refocused pragmatic inquiry on those operational concepts which directed experience rather than exploring its private contours or revealing its structure. In a sense, Dewey became the ultimate Baconian, developing his entire melioristic program from the aphorism: Knowledge is Power. Dewey in fact regarded Bacon as a prophet of pragmatism because of his emphasis on knowledge as a means of control. But Dewey's concept of power bore little resemblance to Peirce's concept of self-control. Science "is not a force to invoke against impulse and habit," he warned against Peirce. Indeed it "is born of impulses" whose "effectual organization into continuous dispositions of inquiry" constituted method. Thus where Peirce had described moral behavior as that which imposed controls over natural processes in the interests of formal structure, Dewey described it as a means to effect a harmony between natural processes in the interests of constructive

interaction.<sup>64</sup>

By thus making values immanent in nature, Dewey rendered social intelligence the preeminent moral method, creating a new role for education as an agent of change. The mind, Dewey claimed, is "an organ of service for the control of the environment in relation to the ends of the life process."<sup>65</sup> Since reason in its adaptive function had constructive potential in both the moral and the physical realms, it became imperative to direct that potential into productive channels. The "ought" relation, Dewey argued, "does not descend out of the *a priori* blue or as an imperative from Mount Sinai."<sup>66</sup> We learn what "ought" to be by exploring experience -- that is, in the same way that we acquire knowledge. Thus all values are had in context and so remain both objective and shared. Moreover, if ethical values in fact subsisted within experience, he argued, education could provide a vehicle for expanding their meaning and enlisting them in the service of reform. The primary role given to education ultimately became the hallmark of Dewey's pragmatic program, setting him apart from both Peirce and James in his emphasis on knowledge as a mode of participation.

But Dewey's reform ideology rested on a curious inversion of the nation's millennial dream. American ideologues had consistently portrayed the existential order as a practical means to a transcendent end -- *eupraxia* the means,

*technologia* the end; politics the means, liberty the end; benevolence the means, redemption the end; capitalism the means, progress the end. Peirce had perpetuated essentially the same vision in his scheme of agapistic evolution. Dewey, on the other hand, working in the context of Jamesian psychology, dissipated the millennial thrust of this characteristic ideology by relocating both the means and the ends of his instrumental model in a perpetual present fully comprehended within the bounds of a reconstructed society. While he reintegrated James' sovereign Self into Peirce's organic community, he did so under a charter which ignored its "unlimited" aspects.<sup>67</sup> Dewey's renovated Citty in fact rested exclusively on a foundation of present experience.<sup>68</sup> Forsaking Peirce's millennial quest for perfect rationality as well as James' existential plea for absolute assurance, Dewey simply settled for a concrete though imperfect reality susceptible of improvement.<sup>69</sup> He just wanted a better world -- and devil take the Promised Land. His community thus emerged as a thoroughly domesticated and naturalized social unit with its eyes fixed firmly on the present.

By eliminating the theoretic aspects of Peirce's principle of continuity, Dewey succeeded in avoiding the angst which had plagued James. But his rendering of pragmatism, having passed through the crucible of James' critique, contained a note of resignation -- a sense of something lost.



By confining man's aspirations within the social order, Dewey effectively neutralized the central insight which had energized the American intellectual tradition since it emerged from the faith of the Fathers. Although his axiology, grounded in an ambiguous ideal of shared imperfections, allowed pragmatic values to be applied as a social program, it presented a sort of plodding promise to minds raised up in a millennial dream and trained to seek a perfect wisdom. It was this lack of transcendence, this loss of dimension, which Josiah Royce protested as he witnessed the steady dismantling of Peirce's categorical structures. But if James can be faulted for confining Peirce's principle of continuity to the individual mind and Dewey blamed for restricting its operation to society, Josiah Royce must stand accused of granting continuity an absolute existence and dissolving it, to paraphrase James, in a sea of Thirdness.

Morton White has described Royce as "the logician of the Oversoul," a borderline scholastic who marshalled immense intellectual resources in defense of a metaphysics which Emerson was content to convey in an epigram.<sup>70</sup> Royce himself recognized Peirce as a profound influence on the development of his thought. In letters to James, he discussed his indebtedness to the *Illustrations* and to Peirce's Boston lectures, while in both volumes of *The World and the Individual*, he named Peirce as a source of

inspiration.<sup>71</sup> Peirce did not always prove grateful for the attribution, however, feeling that Royce confused his realism with an idealism of the Hegelian stripe -- a metaphysics roundly rejected by Peirce in his *Journal of Speculative Philosophy* articles and in his correspondence with William Torrey Harris.<sup>72</sup> While he approved of some of Royce's logical positions, Peirce in fact tried to distance himself as much as possible from most of Royce's metaphysical conclusions.<sup>73</sup>

Like Peirce, Royce described a continuous reality "which is present to an absolutely organized experience."<sup>74</sup> But unlike Peirce, who had characterized his model as a logical possibility, Royce insisted on his as an ontological necessity. By extending the metaphors of evolutionary growth far beyond the boundaries of Peirce's community of inquiry, Royce arrived ultimately at an absolutist conception of continuity which subsumed all logic under purely mental categories and connected inquiry "in all the so-called realism of our prosaic modern research, with the dreamers who dreamed [and] the fantastic poets who failed."<sup>75</sup> For Peirce, truth had functioned as a regulative postulate, the continuous reality disclosed by inquiry reflecting the logical process writ large. But for Royce, logic became a sample of the Absolute writ small, inquiry merely driving the mind forward into ever more comprehensive systems of order.

Once again, the argument turned on the issue of judgement. Royce, working like Dewey in the context of Jamesean psychology, transformed Peirce's mediating perceptual judgements into "partial functions of a self" which projected purpose onto experience. Judgement, he claimed, "is a will seeking its own determination." It reflected a cognitive process "only in so far as it is, at the same time, a voluntary process, an act, the partial fulfillment...of a purpose."<sup>16</sup> Thus, although an idea "means to be true [when] it intends a sort of correspondence with an object," Royce maintained, "what correspondence it intends is determined...solely by the purpose which the idea embodies."<sup>17</sup>

Hence judgement, as a process whereby men clarified their interests and intentions, described "an inner interpretation of our own attitude toward the world."<sup>18</sup> But unlike James, who had confined the operation of "selective interest" to individual experience, Royce expanded the sphere of "interpretation" to encompass that "absolutely organized experience" which served as ground for his Absolute. He described an infinite impersonal experience to which truth could correspond, and then simply postulated a hypothetical subject to comprehend it. By so doing he lifted the principle of continuity out of the social and psychological contexts in which Dewey and James had respec-

tively lodged it and relocated it in an ideal consciousness which comprehended an infinite meaning and purpose.

Peirce, of course, protested -- as he had against both James and Dewey -- that judgement derived its validity from the relational matrix in which it operated and not from the exclusive jurisdiction of any one of its component parts. Judgement indeed reflected purpose, he admitted. But any expression of purpose "refers to the future" and is therefore necessarily a "more or less vague" conditional resolution "to do a thing under certain circumstances." To elevate such a conditional resolve to the status of a transcendent Purpose, Peirce objected, would require the actual fulfillment of all the conditions of possibility entailed by the judgement, which would in turn require "no less than the entire life of the thinker." Royce's translation of conditional resolutions into intensive propositions, he claimed, overstepped "the limits of admissible interpretation" of his pragmatic maxim, leaving "no room for possibility or any lower mode than actuality, among the categories of being."<sup>19</sup>

Peirce had maintained real possibility, or chance, as an active category which provided shades of pragmatic meaning definable as ratios. A similar notion of possibility had presented James with occasions for personal reassurance and Dewey with opportunities for social reconstruction. By contrast, by invoking Purpose as the controlling factor in

"interpretation" and raising logical intension to a cosmic plane, Royce foreclosed on the notion of real possibility and offered simple inclusion as the ultimate form of intelligibility. But Royce's cosmic principle of inclusion bore no resemblance to Peirce's more modest logical one, which had operated as an affair of mediation rather than definition. Under the impact of Royce's transcendent "Interpreter" the tentative, self-corrective aspects of Peirce's method dissolved into an absolute dialectic expressed in pseudo-pragmatic form.<sup>80</sup>

By elevating Peirce's composite "if...then" statements to the status of inviolable dialectical relations, Royce removed them from the objective realm and relocated them under the operation of a "Theoretical Ought" which stipulated that finite or objective purposes merely gave fragmentary expression to a wider truth. The difference emerged clearly in their respective treatments of "leading ideas." Peirce's leading ideas had functioned as hypotheses which the inquirer tested by the application of method -- that is, through observation and experience. But Royce's leading ideas functioned as "guides" which remained by definition impervious to inquiry. They functioned "*despite, or even because, of the fact that evidence can neither confirm nor refute them.*"<sup>81</sup> Royce's theory of science thus departed radically from Peirce's regulative and heuristic method. Indeed the "conceivable effects"

which controlled method for Peirce, having passed through successive incarnations as James' "sensible" and Dewey's "social" creatures, emerged ultimately in Royce as objective manifestations of a transcendent point of view.<sup>82</sup>

Royce called his speculative model Absolute Pragmatism -- a curious contradiction in philosophical terms which must certainly have caused the careful Peirce, already dismayed over James' abuse of his "bantling pragmatism", no small distress.<sup>83</sup> Royce offered his own variation on Peirce's theme as a means whereby to invest the pragmatists' call to action with a moral imperative. Concerned to bolster Dewey's instrumental values with the apodictic force of an absolute metaphysic, Royce simply made "interpretation" the ruling category of his logic and gave it, à la Peirce, a social dimension. "All search for truth," Royce agreed, "is a practical activity, with an ethical purpose. ...A purely theoretical truth, such as should guide no significant active process, is a barren absurdity." But to designate truth as expedient, he argued against James, is simply to give "just a scrap of your personal biography." Hence Royce claimed that James' brand of pragmatism failed as a conception of truth, since it failed as a conception of ethics.<sup>84</sup>

In an attempt to reverse that error, Royce offered an alternative conception of moral obligation which simply subsumed all ethical considerations under the selective

interest of an Absolute Will before which both Peirce's "unlimited community" and James' "uncriticized Self" paled. Royce's definition of "interpretation" allowed him to represent the Absolute itself as an extended individual capable in its omniscience of determining final purpose and thereby elevating pragmatic meaning to the level of certainty. Indeed, under Royce's analysis, Peirce's unlimited community actually took on the psychological aspects of James' sovereign self and emerged as a self-interpreting social mind which comprised the very essence of morality.

Royce articulated his ethical program in a phenomenological analysis of loyalty which declared the community the primal core of the social self. His argument drew on a crucial shift of logical metaphors. Royce distinguished subsumption under a class from membership, invoking the mathematical image of the infinite series as justification. The relation of the individual to the community, he argued, described more than the relation of part to whole since the community itself transfigured the individual and raised him to higher level of being. Hence the social aggregate emerged as "one conscious spiritual whole" capable itself of interpreting.

"A community is not a mere collection of individuals," Royce maintained. "It is a sort of live unit, that has organs, as the body of an individual has organs. ...Not

only does the community live, it has a mind of its own -- a mind whose psychology is not the same as the psychology of an individual human being."<sup>55</sup> This social mind interpreted the ideas of all the members of the community to one another. Indeed "a genuinely and loyally united community which lives a coherent life, is, in a perfectly literal sense, a person. ...On the other hand, any human individual person in a perfectly literal sense, is a community."<sup>56</sup>

By treating James' behavioral manifestations as signs and Dewey's interactive conduct as interpretation, Royce could actually portray the social process as an infinitely extended "determination of self." "A process of interpretation," Royce argued, "involves, of necessity, an infinite sequence of acts of interpretation." Moreover, each time someone interpreted a second to a third, a triadic community of interpretation existed. Interpretation thus involved a process in which the mind interpreting and the mind interpreted to achieved a unity and in a sense became an individual. This synthetic individual, as the possessor of a mediating idea, projected an actual "spirit of community" which itself took on the lineaments of an interpreter capable of setting and achieving goals. Through this process, society became in effect a "Community of Interpretation" which "unifie[d] all the social varieties and all the social communities which, for any reason, we know to be real in the empirical world." Indeed "the



history of the universe, the whole order of time, is the history and the order and the expression of this Universal Community" which commanded, by virtue of its very constitution, the loyalty of man to Man.<sup>87</sup>

Royce's philosophy of loyalty thus restored that transcendent dimension missing from James' and Dewey's instrumental programs -- indeed, it restored it with a vengeance. In what Kuklick terms "a dramatic postulation leap," Royce restated America's characteristic millennial dream as a function of formal mathematics and Darwinian lore, describing the social-evolutionary emergence of the species into a spiritual community.<sup>88</sup> But as he leapt, Royce let go that line which had kept Peirce securely tethered in the objective world. By sacrificing the relational matrix of Peirce's categories to an overarching category of Being, Royce effectively abandoned the tentative, self-corrective method which had underwritten Peirce's thought in favor of a dialectical certainty which made James' psychological assurance appear positively anemic by comparison.

James, Dewey and Royce each enriched a portion of Peirce's encyclopedic thought -- James with his psychological critique, Dewey with his sociological program and Royce with his ethical analysis. But none of the three seemed to appreciate the "principle of universal continuity" on which Peirce had insisted. In fact, each seemed intent on sub-

verting the relational matrix which Peirce had established in favor of one or another of its component parts. The result in each case was a curiously monophonic refrain which lacked the depth and symmetry of Peirce's "symphony of intellectual life." Peirce had attempted to offer a comprehensive method for defining truth as well as determining meaning and managing conduct. The harmonic support which each of his categories gave to the others allowed him to extend that method across all disciplines and claim universal jurisdiction for his logic of science. James, Dewey and Royce, on the other hand, ended by playing instrumental variations on discrete segments of Peirce's theme and missing its polyphonic structure.

Like a good Ramean, Peirce had developed his practices within the boundaries of an encircling *ars technologicae*, continually integrating the functional status of means and ends in the construction of a continuous reality. This was the characteristic American vision which his successors obscured -- some by excess, some by default. This was the faith of the Fathers, the platform of the politicians, the agenda of the scientists which had underwritten the development of American ideology since the founding of the City. It would remain for a later generation of American intellectuals, chastened by the trauma of World War and domestic disaster, to restore the outlines of Peirce's synoptic thought and reestablish American logic in a

trajectory which would ultimately reconnect it with its  
Ramean roots.

CHAPTER NOTES

1. CP 1.23.
2. CP 2.146; CP 5.568; CP 1.243; CP 2.141; CP 5.157.  
See also CP 1.253; CP 5.115; CP 5.150.
3. Thomas Goudge points out that the "path to nominalism is blocked by Peirce's distinction between Secondness and Thirdness. According to it, existence is limited to individual facts, and cannot properly be talked of in connection with generals" (Thought, 98). Thus Peirce did not need to assert the existence of law or generality, only its reality. For a discussion of the central role of Thirdness in the development of Peirce's semiotic, see T. L. Short, "Life Among the Legisigns" in Deeley, Frontiers, 105 passim.
4. Quoted in Commager, American Mind, 50.
5. Mulvaney and Zeltner emphasize the importance of the wider social setting for the development of American thought at the end of the 19th Century and argue that the pragmatic model, initiated by doubt and culminating in a stabilizing belief, in fact reflected the conditions of tension and instability characteristic of the society at large. See Pragmatism: Its Sources and Prospects (Columbia, 1981), 6-15.
6. Commager, American Mind, 49-51.
7. See Morton G. White, "The Revolt Against Formalism in American Social Thought of the 20th Century," JHI 8(1947):131-151. White argues for "a distinctive liberal *Weltanschauung* of 20th Century America" grounded in a "joint participation in a revolt against formalism and a consequent acceptance of the central importance of historical and cultural analysis." He names Beard, Dewey, Holmes, Robinson and Veblen as participants in the revolt. See also White, Science and Sentiment.
8. Personal letter of William James to Tom Ward, March, 1869, in the Houghton Library at Harvard University.
9. Perry, Thought and Character, II, 409.
10. Feibleman, Introduction, 469.
11. The Monist 15(1905):161-181.

12. CP 6.482.
13. CE 2.229. See also CP 1.46-48, where Peirce describes the "scientific imagination" as the source of fruitful hypotheses.
14. CE 3.285.
15. CP 1.199; CP 2.428; CP 5.55, CP 5.486, CP 2.148, CP 5.4, CP 3.93n. See also CP 3.432.
16. William James, Collected Essays and Reviews (New York, 1920), 376. See also The Meaning of Truth (New York, 1909), 43-50. For a comparative discussion of James and Hume on belief, see J. B. Shouse, "David Hume and William James: A Comparison," JHI 13(1952):514-527.
17. William James, "The Psychology of Belief," Mind 14(1889):336. "Truth *ante rem* means only verifiability," James declared (Pragmatism (New York, 1907), 22).
18. James, Meaning of Truth, 304 and Pragmatism, 58,61. Here James came close to Bergson's analysis of verification. James himself acknowledged the similarities between his pragmatism and Bergson's "creative evolution" in a letter to the French philosopher in 1907: "I feel that at bottom we are fighting the same fight, you a commander, I in the ranks." Ironically, James seemed to perceive the deficiencies of his own theories next to those of Bergson -- deficiencies which related directly to his misinterpretation of Peirce's synoptic insights. While he missed the significance of Peirce's principle of continuity, he perceived that Bergson "set things straight at a single stroke by [his] fundamental conception of the continuously creative nature of reality" (Henry James, Letters of William James (Boston, 1920) II, 292).
19. William James, Principles of Psychology (New York, 1890), II, 661, note 2; 639-640.
20. William James, Pluralistic Universe, (New York, 1912), 212.
21. James, Meaning of Truth, 85-86; Pluralistic Universe, 212.
22. C. S. Peirce, review of "James's Psychology. - I," The Nation, 53(1891):15.
23. Ibid., 15-16.
24. See "Is Perception Unconscious Inference?" in James, Principles, II, 111-114.

25. C. S. Peirce, review of "James's Psychology. -- II," The Nation 53(1891):32-33.

26. Ibid., 33. The *modus ponens* is an argument in the form:

If A, then B;  
But A:  
Hence, B.

In short, it is a composite or hypothetical statement of the type endorsed by both Ramus and Peirce in their analysis of method.

27. Ibid., 33. For interesting related discussions of the impact of German logic and philosophy on James' thought see Daniel J. Cook, "James's Ether Mysticism and Hegel," JHP 15(1977):309-319; Otto F. Kraushaar, "Lotze's Influence on the Pragmatism and Practical Philosophy of William James," JHI 1(1940):439-458; Roald B. Levinson, "Sigwart's Logic and William James," JHI 8(1947):475-48; Paul Weigand, "Notes on Psychological Types in Friedrich Schiller and William James," JHI 13(1952):376-383.

28. Peirce, "James' Psychology -- II," 33. Although James discarded the atomistic view of Locke and Hume which implied a one-to-one causal relation between individual brain irritations and discrete elements of consciousness in favor of a wholistic view in which consciousness related to brain action as a whole, he still maintained the irreducible associationist distinction between the two. See "On Some Omissions of Introspective Psychology," Mind, 9(1884):3.

29. Peirce, "James' Psychology -- II," 32-33.

30. For an interesting discussion of this transformation with reference to Peircean metaphysics, see White, Science and Sentiment, 155-160. A. O. Lovejoy also offers an interesting analysis of this fundamental difference between Peirce and James' pragmatism in "The Thirteen Pragmatists," Journal of Philosophy 5(1908):5-39.

31. CE 3.263; William James, "Is Life Worth Living?," International Journal of Ethics 6(1897):7; "What the Will Effects," Collected Essays, 243. James argued that truth was "revealed to the heart," a bias he came by naturally via a father steeped in Swedenborgian mysticism and sustained by an Edwardsean faith. Educated at Union College, a center of Neo-Edwardsean orthodoxy in the early

19th Century, Henry James, Sr. spent a large part of his life articulating a characteristic theology which stressed the intimate and unmediated communion of each man with God. Tying Edwards' psychological interpretation of revelation to the communal aspects of New England Transcendentalism, the elder James arrived at a philosophy which acknowledged the intuitive feelings and metaphysical satisfactions which lay beyond "mere" intellectual reasoning and advocated a program of salvation which went far beyond simple schemes of self-improvement. As with Peirce, for whom the intellectual propensities of the father were also visited upon the son, James absorbed many of the compelling insights of his formidable father, claiming at one point that he "derived all his intellectual life" from him (Letters, I, 219). A comparative investigation of Benjamin Peirce and Henry James, Sr., made in the context their sons' later intellectual development, would make a fascinating study.

32. James, "Psychology of Belief," 343, 331.

33. Ibid., 325, 352; "What the Will Effects," Collected Essays, 247; Principles, I, 402.

34. CE 3.311-318. See above, pp ?? Chap VII.

35. James, Letters, II, 236. For Peirce, on the other hand, sign was the wider category. While all thoughts were signs, not all signs were thoughts (CP 1.538, 5.253).

36. James, Pragmatism, 83-84, 120-122; "Psychology of Belief," 333, 352.

37. James, "Is Life Worth Living?," 22. James' anti-intellectualism was grounded, not in a logical skepticism as for Peirce, but rather in a concern for the vitalistic dimensions of psychic life. Like Schopenhauer and Nietzsche, he held that any abstraction from experience diluted the vivid perceptions of good and evil which fed the inner life -- a life which must be grasped from within the individual organism without reference to any mediating concepts or even to the experience of others. James' own experience with "panic fear" perfectly expressed this view. But rather than remaining trapped in the lived experience of his own ontological insecurity like a good Existentialist, James chose -- an important word! -- to forge his own path "beyond good and evil." "It is at this point," Weinstein claims, "that the possibility for an American existentialism was lost" (Wilderness, 80). For an interesting related discussion see George J. Stack, "Nietzsche's Influence on Pragmatic Humanism," JHP 20(1982):369-406.

38. Peirce, on the other hand, had declared that the

person "is only a particular kind of general idea" (CP 6.270). The difference in orientation derived from the type of reality which the two ascribed to relations. For Peirce, relations had been cognitive, although experienced as a part of analysis. But James argued that relations "must themselves be experienced relations" (Essays in Radical Empiricism (Cambridge, 1976), 22). In short, they must be "felt." James would never admit to anything which existed outside of experience. He would never allow, as did Peirce, the inherently unverifiable on the grounds of "mere" logic. He never seemed to comprehend that Peirce's logic itself grew from and encompassed experience.

39. James sustained no active interest in social theory and evidenced only a quixotic interest in social causes. He was guilty, Hofstadter claims, "of only the remotest interest in systematic or collective social reform" (Social Darwinism, 134).

40. The difficulty for James, beginning from his radical empiricist position, was to establish some community of meaning which would make his "willed" theoretic beliefs applicable to life. This was essentially the difficulty which C. A. Strong and Dickinson Miller pointed out to him, suggesting that he should, on pragmatic grounds, regard the world as a context held jointly by many observers which served to locate individual perceptions in a public space. By 1912 James had deferred to their comments, conceding that differences in perspective were public differences and therefore presupposed a common frame of reference (Essays in Radical Empiricism, 85). This revised position, which James called "natural realism", in fact took him quite close to Peirce's own argument, although Peirce had approached the problem, characteristically, from a logical, rather than a psychological, point of view. For an interesting discussion which ties this issue to related issues addressed in Chapters III and IV, see E. G. Howells, "Hume, Shaftesbury, and the Peirce-James Controversy," JHP 15(1977):449-462.

41. James, "What the Will Effects," 246-248.

42. Quoted in Weiner, Values, xxii; CP 1.178.

43. For an intriguing discussion of some of the broader implications of plurality and individualism which relate directly to post-Darwinian philosophical adjustments, see Hans Jonas, "The Biological Foundations of Individuality" in Essays, 185-205. "Individuality," Jonas maintains, "implies discontinuity."

44. James, Collected Essays, 443-444 (emphasis mine).



45. CP 5.402n; CP 5.423.
46. Quoted in Perry, Thought and Character, II, 424-425; Weiner, Values, xxii.
47. Commager, Mind, 96.
48. CP 6.480. Goudge places the shift in Peirce's thought around the turn of the century (Thought, 294-295).
49. CP 5.130, 1.573.
50. John Dewey, The Quest for Certainty (New York, 1929), 43.
51. John Dewey, Experience and Nature (Chicago, 1925), iii.
52. For Dewey this meant simply "that while inquiry into inquiry is the *causa cognoscendi* of logical forms, primary inquiry is itself *causa essendi* of the forms which inquiry into inquiry discloses" (Logic: The Theory of Inquiry (New York, 1938), 4, 119). James, on the other hand, appears at some points to admit the existence of "fundamental categories, long ago wrought in the structure of our consciousness, and practically irreversible, which define the frame-work within which our answers must fall" (Pragmatism, 382; Principles, II, 618).
53. John Dewey, From Absolutism to Experimentalism (London, 1930), 27.
54. Dewey, Experience and Nature, 4.
55. "Dewey," Feibleman claims, "is, by his predilections, a realist of the Peircean persuasion, but, led by an interest in the metaphysical importance of actuality to substitute activity for the place occupied by the particular in Peirce's philosophy, he came to hold an explicit nominalistic position which is essentially alien to the point of view we associate with the name of Peirce." Feibleman lists thirteen specific points on which Dewey is in accord with what he terms the "realism" of Peirce, including the relativity of matter and form, the abstract character of scientific objects, the equation of ideas and possibilities, etc. But, he concludes, "the notion that the shift from the particular to the act marks a gain in generality is the error which pervades Dewey's whole account of logic and makes his philosophy over into one which is in opposition to that of Peirce" (Introduction, 482-483, 475).
56. Dewey, Logic, 104-105, 143.

57. Dewey, Quest for Certainty, 24-26, 132-134- 159-161. To put it in the terms of Peirce's scholastics, thinking for Dewey became *ratio* rather than *intellectus*.

58. John Dewey, Studies in Logical Theory (Chicago, 1903), 13.

59. C. S. Peirce, review of "Studies in Logical Theory," The Nation 79(1904):220; CP 5.508.

60. Dewey, Experience and Nature, 196.

61. Dewey, Studies, 13. This aspect of Dewey's thought reached its fullest development with Mead's Mind, Self and Society, which declared all meaning to be implicit in various phases of the social act. Mead developed Dewey's theme of the reciprocal relation between the individual and society into a full-blown social psychology. "If we admit," he pointed out, "that the evolutionary process consists in a mutual determination of the individual and his environment, ...moral necessity in conduct is found in the very evolutionary situation." (Movements of Thought in the 19th Century (Chicago, 1936), 168). Mead also drew heavily on semiotics for his theory of self-hood, linking him in retrospect to Peirce. But unlike Peirce, Mead saw the mind as an emergent, not a generative, force in semiosis. Hence he defined reality as a complex of perspectives organized around the principle of sociality. In a sense, Mead's "sociality" functioned, as Thirdness had for Peirce, as a regulative principle.

62. Dewey, Logic, 8-9. "So far as I know," Dewey wrote, "Mr. Charles S. Peirce was the first to call attention to this principle, and to insist upon its fundamental logical import. ...Mr. Peirce states it as the principle of continuity" (Logical Conditions of a Scientific Treatment of Morality (Chicago, 1903), 14). Ironically, however, when Studies in Logical Theory appeared in Chicago under Dewey's editorship, the preface noted a "pre-eminent obligation ...to William James" but failed to acknowledge any debt to Peirce.

63. *Ibid.*, 17.

64. John Dewey, Human Nature and Conduct (New York, 1922), 195-196.

65. John Dewey, "The Interpretation of Savage Mind," Psychological Review 9(1902):219. Dewey developed this theme in his famous argument against the "spectator theory of knowledge." Mind, he claimed, is no spectator observing the world from without. It is in the world as a part of the process. Similarly, intelligence is not something man

brings to bear on nature. It is nature itself creating and preserving opportunities for a richer life.

66. John Dewey, The Theory of Valuation (Chicago, 1939), 32.

67. For a discussion of Dewey's concept of community which has interesting echoes in the present context, see Beth J. Singer, "Dewey's Concept of Community: A Critique," JHP 23(1985):555-569. Singer comments on the emphasis which Dewey's model places on communication as a component of community. See also B. T. Wilkins, "James, Dewey, and Hegelian Idealism," JHI 17(1956):332-446. Wilkins compares James' and Dewey's concepts of the individual in the context of a communal ideal.

68. Dewey's philosophy did not, however, lack for an aesthetic dimension. The qualities of primary experience, he claimed, were all aesthetic. They possessed a symmetry and a balance (notice that he carefully avoids the word *order*!) which, when transformed by the mind into substance, constituted art. The arts in fact portrayed an intensified form of experience which had the power to restore continuity to men's lives by putting them back in touch with the source of their intellectual and institutional constructs. For Dewey, as for Emerson, art thus possessed a redemptive power. This was essentially the aspect of Dewey's naturalism which Santayana developed. Ethics and aesthetics, Santayana claimed, were the product of "imaginative impulses fortunately moral" (Winds of Doctrine (New York, 1975), 108).

69. This is where Dewey's pragmatism spilled over into Progressivism. The ambiguous program of progressive reforms drew on precisely those "moral emotions" which Dewey had validated through his logic. For what Hofstadter calls "The Current of Pragmatism" running through progressive ideology, see Social Darwinism, 123-142. See also Alan Cywar, "John Dewey: Toward Domestic Reconstruction, 1915-1920," JHI 30(1961):385-400.

70. Morton White, Science and Sentiment, 228, 299.

71. Perry, Thought and Character, I, 788; II, 421.

72. CE 2.162-309; CE 2.132-161.

73. See CP 1.343; 3.563 and Peirce's review of "The World and the Individual," The Nation 75(1902):94-96). James was similarly ambiguous in his response to Royce's idealism, writing to him in 1900: "I lead a parasitic life upon you, for my highest flight of ambitious ideality is to become your conqueror, and go down in history as such, you

and I rolled in one another's arms and silent (or rather loquacious still) in one last death-grapple of an embrace" (Letters, II, 136).

74. Josiah Royce, The Conception of God (New York 1898), 31.

75. Josiah Royce, The Spirit of Modern Philosophy (Boston, 1892), 281.

76. Josiah Royce, The World and the Individual (New York, 1900), 325, 332. Royce's argument was grounded in the distinction between what he termed the Worlds of Description and Appreciation, the one embodying objects or external meaning, the other embodying purpose or internal meaning. Royce maintained that since the World of Description presupposed the World of Appreciation, the world of objects must exist as a part of an infinite purpose viewed from the perspective of an ideal mind. See Kuklick's chapter "The World and the Individual" in Josiah Royce: An Intellectual Biography (Indianapolis, 1972), 99-118 for an in depth discussion.

77. Royce, World, I, 319-320.

78. Josiah Royce, The Outlines of Psychology (New York, 1903), 164, 194-196. Kuklick describes Roycean interpretation as "that form of cognition involved in the knowledge of mind. When a man clarifies his own interests and meanings and acquires knowledge of his self, he is interpreting," he explains, adding that "through interpretation we also learn of the social relations between man and man, our knowledge of other minds" (Royce, 213). The important thing to notice here is that Royce's process of interpretation is confined exclusively to the knowledge of minds. Using self-knowledge as the paradigmatic form of interpretation Royce ultimately concluded that the whole world process was mental (The Problem of Christianity (Chicago, 1968), 245).

79. C.S. Peirce, review of "The World and The Individual," The Nation 75(1903):94-96.

80. "The whole clash of rationalistic and empirical religion," James had pointed out, centered on "the validity of possibility." James solved the problem with his characteristically apt discussion of "the possible chicken" and "the actual egg" (See Perry, Thought and Character, 727-728). But Royce attacked James' view on the status of possible experience in The Absolute and the Individual, where he concluded that valid possible experiences in fact merely reflected parts of the actual experience of the Absolute. Royce thus went beyond the fallibilism which had tempered

Peirce's tentative method to a dialectical argument in which "The Possibility of Error" effectively transformed James' provisional "Will to Believe" into a palpable path to truth. Royce in fact considered the possibility of error to be the only escape from relativism and the guarantor of absolute truth.

81. Royce's Logical Essays, ed D. Robinson (Dubuque, 1951), 263-274 (emphasis his). "While experience is always the guide," Royce argued in the same passage, "the attitude of the investigator towards experience is determined by interests which have to be partially due to what I should call the 'internal meaning', that human interest in rational theoretical construction which inspires the scientific inquiry; ...[Thus] the theoretical constructions which prevail...are neither unbiased reports of the actual constitution of an external reality, nor yet arbitrary constructions of fancy."

82. "The seeming," Royce argued, "is opposed to reality only in so far as the chance experience of one point of view gets contrasted with what would be, or might be experienced from some larger more rationally permanent, or more inclusive and uniting point of view" (The Conception of God (New York, 1909), 30-31). Royce seems here to be espousing Peirce's ideal of an unlimited community of inquiry. "Yet there is a difference," Morton White points out, "between Peirce's view...and Royce's view, because where Peirce refers to a normal eye, Royce refers to a larger, more organized and uniting experience; and thereby hangs a tale that leads to Royce's Absolute" (Science and Sentiment, 221).

83. CP 5.414.

84. Josiah Royce, Philosophy of Loyalty (New York, 1908), 324-348, 336-337.

85. Royce, Problem of Christianity, 194 218, 80.

86. Letters of Josiah Royce, ed. John Clendenning (Chicago, 1970), 646. Although Royce's early arguments had viewed inclusion as a simple relation of part to whole, his later writings contain this more complex interpretation. Kuklick attributes the shift in Royce's argument to a reciprocal influence between himself and James. See chapters 2 and 4 in Royce, 25-48, 67-97. Schneider on the other hand, attributes the shift to Peirce's suggestion that Royce investigate logic and formal mathematics. See History, 415-424.

87. Royce, Problem of Christianity, 272-273. Herbert Schneider points out that "the type of community which

Royce means is exhibited better in the church than in science. The true church, and here Royce's idealism reverts to Calvinism, is a community of memory and hope, a unity of faith and redeeming grace. ...Ordinary political society does not conform to this type of community, for it breeds individualism, and individualism is 'the sin against the Holy Ghost.' To be a real individual, one must be a loyal member, for only through God's grace in the community is salvation, self-hood, possible. God is simply the 'spirit-of-the-community', the essence of loyalty" (History, 423-424).

88. Kuklick notes that evolution became for Royce "the form in which finite creatures, constrained to time and space, must perceive the world-self." Evolutionary theory merely described "how the temporal constantly yearned to overreach itself; with the ever-increasing growth of consciousness, it strove for the eternal" (Rise, 157). Royce, in fact, claimed that idealism was the only philosophy which could grasp the underlying significance of Darwinian thought. See Kuklick's chapter "The World of Description and Philosophical Psychology" in Royce, 67-97.

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## EPILOGUE

In 1910 James died. Two years later Santayana began his retreat into intellectual exile. Within another two years Peirce had passed from the scene, leaving behind that ragged assortment of articles, papers, notes, drafts, letters and scribblings which constitute his collected works. By 1916 Royce had merged with his cherished Absolute, leaving the prolific and articulate Dewey as the "spokesman" of American Pragmatism. Dewey's one-dimensional program proved signally incapable of expressing the energizing insights which had lain behind Peirce's manifold thought. And yet, his was the voice which preached pragmatism to the generation of scholars and theorists who emerged from the trauma of World War in search of a philosophic rationale.

Peirce's papers remained in disarray for some twenty years after his death -- indeed for those two crucial decades during which Neo-Progressives, Neo-Liberals, Neo-Democrats, Neo-Conservatives, Neo-Romantics, Neo-Humanists, Neo-Orthodoxy, Neo-just-about-everything vied for preeminence of place in the reconstruction of the nation's ideology. The economic instability of the 1920's and the resultant social dislocations merely served to deepen the philosophic malaise consequent upon the war, encouraging a bumper crop of Neo-Critics who presided over what Henry May

has called "the end of American innocence." Campaigning under various reactionary banners -- anti-intellectualism, anti-modernism, anti-urbanism, anti-positivism, anti-relativism -- these intellectual gad-flies unfortunately proved more adept at dismantling their philosophic past than at articulating a viable program for social regeneration. Facilitated by social cynics and social visionaries alike, the prevailing mood of disillusionment and decline gradually degenerated into what T. Jackson Lears has described as a kind of "cultural neuresthenia" which betrayed the sorry state of the national consciousness.

Dewey's pragmatism offered no solace. Indeed, his instrumentalism appeared as a kind of cruel caricature of the millennial dream which had previously supported the nation's intellectual life. Frustrated by a lack of moral rigor in American life and a concomitant lack of logical rigor in American thought, a movement arose to widen the philosophic debate. Significantly, this movement reached out, not to the psychologism of James, or the instrumentalism of Dewey, or the idealism of Royce, but rather to what Alfred Kazin has called "the instinctive realism" of the American mind -- a realism integral to the philosophic program of Peirce, but temporarily obscured by the less stringent formulas of his successors.

Developed variously as an indigenous Neo-Realism, a derivative Critical Realism, and through Structuralist and



Semiotic analyses, this movement tended generally to accept the objectivity of particular things, endorse the independent reality of noetic structures, emphasize the centrality of sign relations, and acknowledge the intimate connection between knowledge and belief. Grounding their arguments in the "existential realism of common use," this new generation of realists revalidated that world of consensual knowledge which had underwritten Peirce's pragmatic vision and prepared the way for a reassessment of his logical program. By 1935, supported by developments in mathematical logic and refinements in the philosophy of science articulated by figures such as Einstein, Russell, Whitehead and Freud, they had created an intellectual climate in which Peirce's theories could gain a sympathetic hearing. Indeed, the publication of the early volumes of Peirce's *Collected Papers* in the late 1930's instituted a revival of interest in his thought which, far from dissipating itself among the various scholarly perspectives it spawned, has tended rather to gain force and direction, serving ultimately to establish Peirce as a crucial figure in the development of American thought.

From the vantage point of the 1990's we read Royce with nostalgia, James with sympathy and Dewey with forbearance. But we read Peirce with recognition. In his philosophical program we recognize echoes of our intellectual past, solutions for our complex present and a justification for hope

in a problematic future. Indeed in Peirce we continue to recognize a true spokesman of the American mind -- a voice speaking with accents peculiar to our native Ramean heritage.

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